



## Workshop Manual

Fox 2004 ➤

Fox 2010 ➤

Fox 2014 ➤

### 4 - Cyl. injection engine (1.0 l)

Engine ID	BJE	AQZ	BNX	CCN A	CPB A				
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Edition 09.2017





## List of Workshop Manual Repair Groups

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.



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## 00 – Technical data

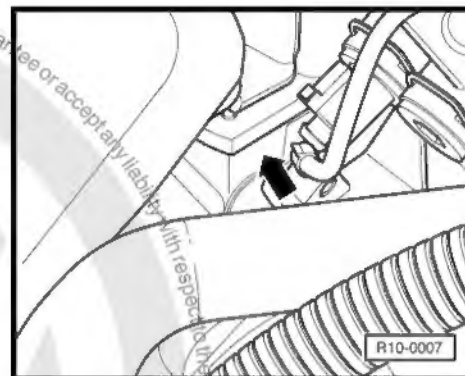
### 1 Technical Data

(VRL010824; Edition 09.2017)

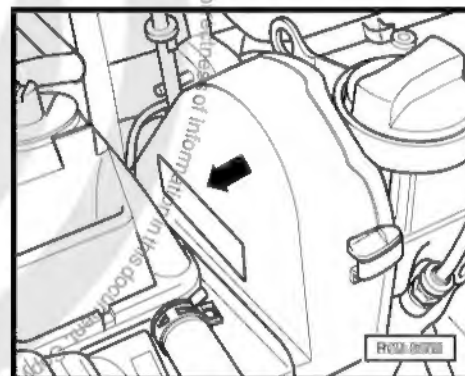
#### 1.1 Engine number

The engine number ("identification letters" and "serial number") is engraved on the engine block, under the thermostat valve body.

The engine number is comprised of nine digits (alphanumeric) at most. The first part (max. of three identification letters) represents "the engine identification letters"; the second part (six characters) represents the "serial number". If more than 999,999 engines with the same engine codes are produced, the first of the six digits is replaced by a letter.



Additionally, there is a sticker -arrow- containing the "engine codes" and "series number" on the mechanical distribution cover.



#### 1.2 Engine characteristics

Engine codes	AQZ (petrol)	BJE (Total flex)	BNX (Total flex)	CCNA (Total flex)	CPBA (Total flex)
Production	08/2003 to 12/2009	08/2003 to 04/2005	04/2005 to 03/2008	03/2008 to 08/2012	07/2012 ➤
Cylinder volume cm <sup>3</sup>	999	999	999	999	999
Power (petrol) hp(kW)/rpm	71.0 (52.0)/6000	71.0 (52.0)/6000	72.0 (53.0)/5750	72.0 (53.0)/5250	72.0 (53.0)/5250
Power (ethanol) hp(kW)/rpm	---	72.0 (53.0)/6000	73.0 (54.0)/5750	76.0 (56.0)/5250	76.0 (56.0)/5250
Torque (petrol) Nm (mkgf)/rpm	89.0 (9.1)/4500	89.0 (9.1)/4500	93.0 (9.5)/4300	95.0 (9.7)/3850	96.0 (9.7)/3850
Torque (ethanol) Nm (mkgf)/rpm	---	90.0 (9.2)/4500	96.0 (9.8)/4300	104.0 (10.6)/3850	104.0 (10.6)/3850
Diameter Ø mm	67.11	67.11	67.11	67.11	67.11
Stroke mm	70.6	70.6	70.6	70.6	70.6
Compression rate	10.8:1	10.8:1	13.0:1	13.0:1	12.7:1



Engine codes	AQZ (petrol)	BJE (Total flex)	BNX (Total flex)	CCNA (Total flex)	CPBA (Total flex)
Fuel	Regular unleaded petrol	Bi-fuel (Unleaded gasoline/Ethanol)	Bi-fuel (Unleaded gasoline/Ethanol)	Bi-fuel (Unleaded gasoline/Ethanol)	Bi-fuel (Unleaded gasoline/Ethanol)
Injection, ignition	MARELLI 4BV	MARELLI 4BV	MARELLI 4BV	MARELLI 4GV	BOSCH ME 17.5.20
Knock control	1 knock sensor	1 knock sensor	1 knock sensor	1 knock sensor	1 knock sensor
Self-diagnosis	yes	yes	yes	yes	yes
Lambda adjustment	1 probe	1 probe	1 probe	1 probes <sup>1)</sup>	2 probes
Catalytic converter	yes	yes	yes	yes	yes

1) 2 lambda probes only for the Novo Fox version



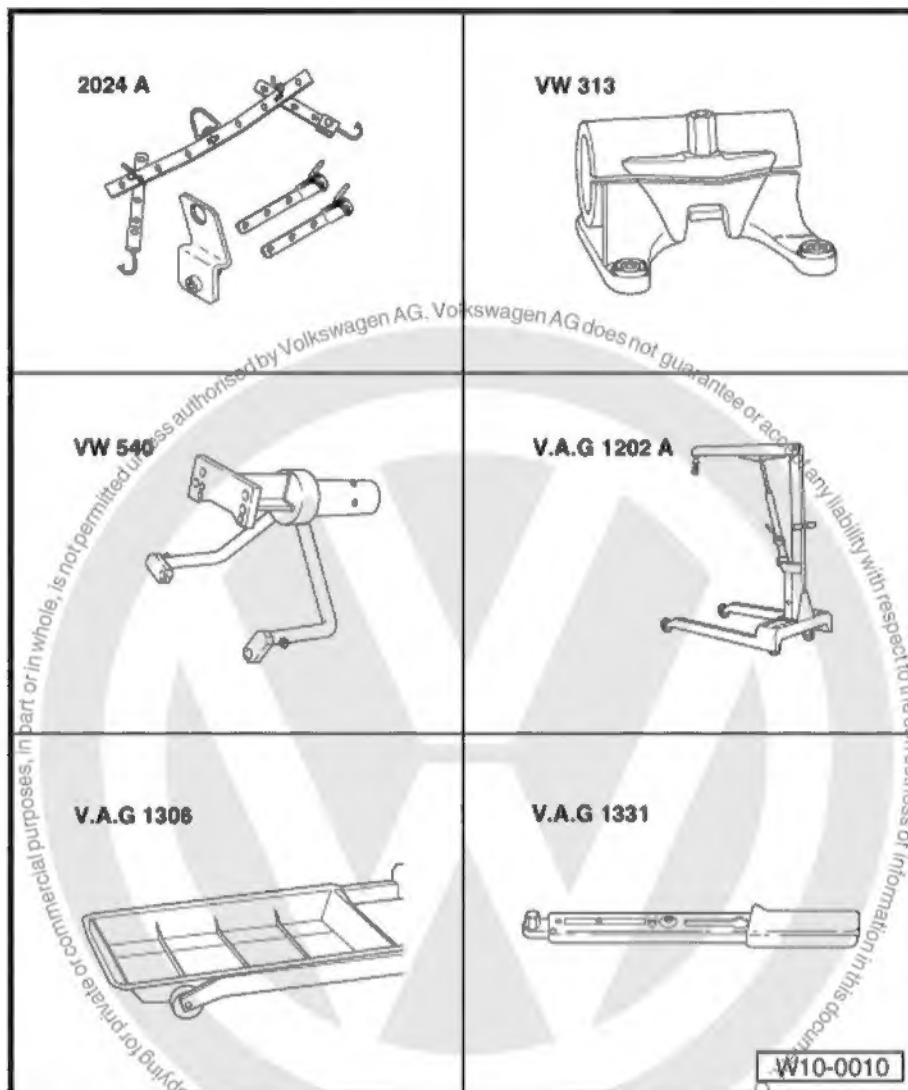




## 10 – Removing and installing engine

### 1 Engine - remove and install

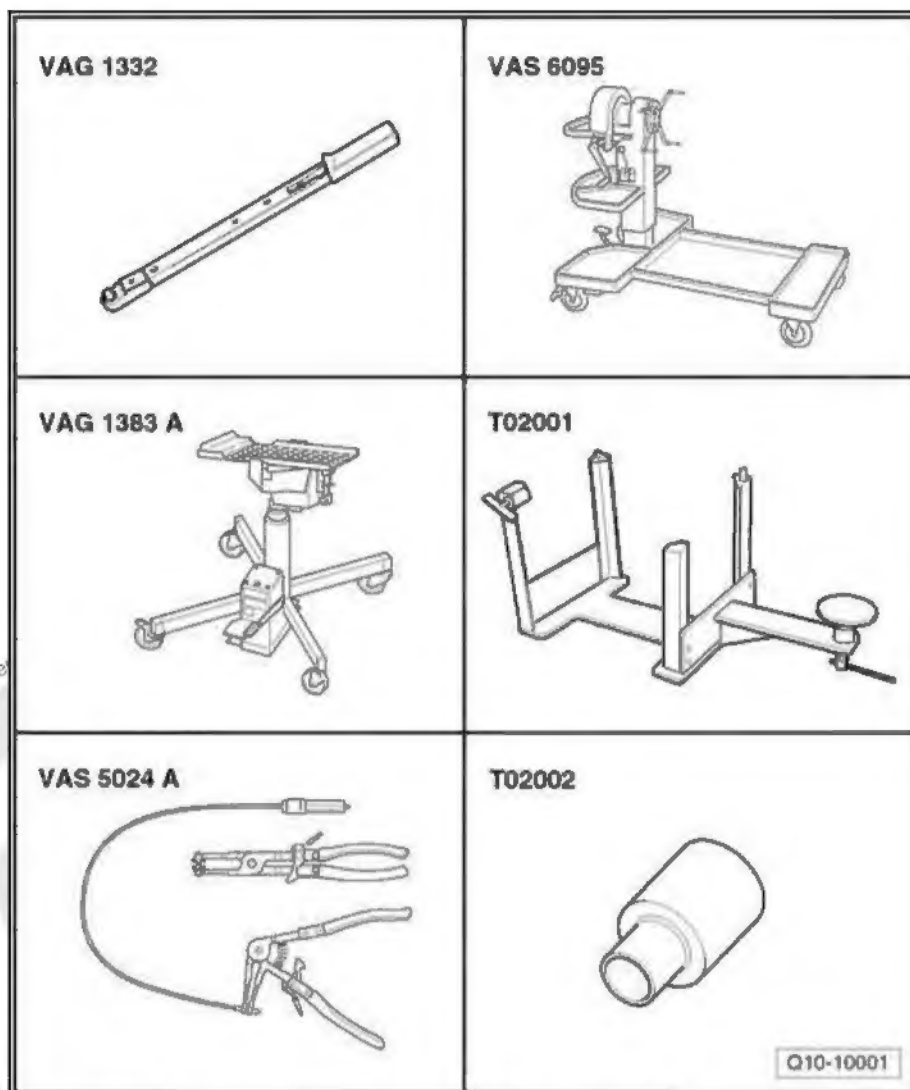
Special tools and workshop equipment required



- ◆ Lifting tackle - 2024A-
- ◆ Support - VW 540-
- ◆ Hydraulic hoist - VAG 1202A-
- ◆ Oil trap - VAG 1306-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331- .

No illustration:

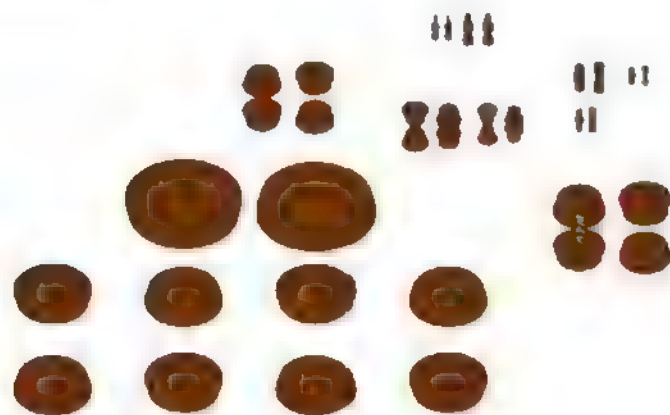
- ◆ Lifting eyelets # of replacement part: -030 103 390 F- (pulley side) -030 103 390 G- (inertia flywheel side).
- ◆ Grease - G 000 100- and Grease - G 000 150- (vehicles with manual gearbox)
- ◆ Cable tie



- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-
- ◆ Support for VW 643 or VW 643/1 - VW 313- or Rotary stand for engine and gearbox - VAS 6095-
- ◆ Gearbox or engine + gearbox assembly jack or VAG 1383A set - EQ 7081-
- ◆ Device - T02001-
- ◆ Standard-type clamp pliers - VW 5162 (VWB) - ou - VAS 5024A- , or Standard-type clamp pliers - VAS 6340-
- ◆ Adaptor bushing - T02002-



## VAS 6122



W00-11228

- ◆ Sealing plug kit (engine) - VAS 6122-

## T10249



W00-11208

- ◆ Pipe sealing tool - T10249-



VAS 5085



W00-0713

◆ 5-Step ladder - VAS 5085-

1.1 Removal - recommendations



Note

*Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting earth wire from the Battery - A-.*

- The engine is removed from the lower part of the vehicle with the gearbox.
- With ignition off, disconnect earth wire from the Battery - A-.
- All cable clamps that open or break during engine removal must be replaced and installed in the same locations when engine is reinstalled.
- Remove air filter ⇒ [page 169](#).



- Remove the Battery - A- and the Battery - A- console ➤ Electrical equipment; Rep gr. 27 ; Starter, alternator, battery .

The cooling system is under pressure when the engine is hot. Thus, it is necessary to reduce the pressure before conducting repairs.



**WARNING**

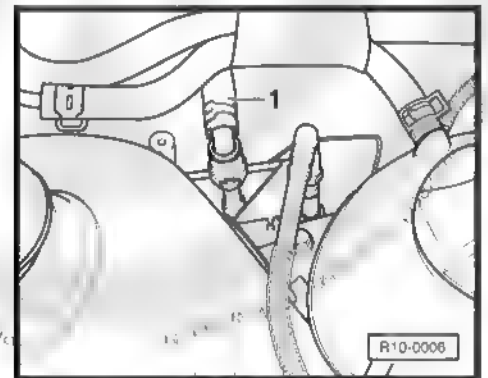
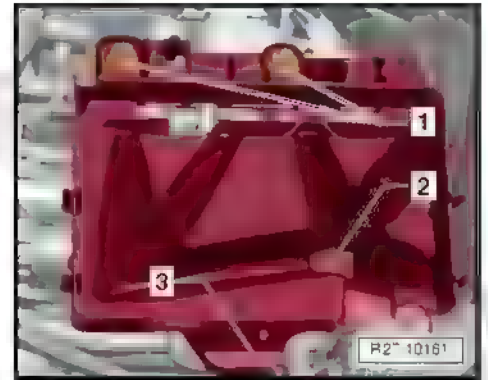
*Hot vapours may escape when the coolant reservoir is opened; cover it with a cloth and open carefully.*



**WARNING**

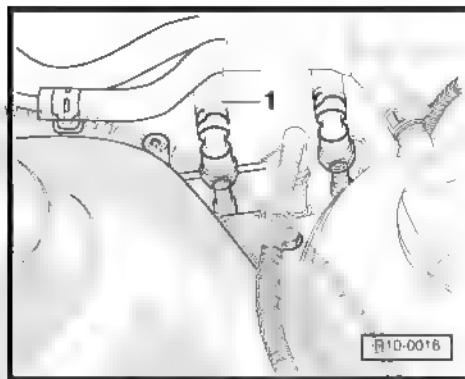
*Fuel supply hose is under pressure. Wrap hose connections in cloth prior to loosening. Next, eliminate pressure by carefully removing hose.*

- Loosen the fuel supply pipes 1 (press the key to unlock) (engine AQZ).





- Disconnect the fuel supply pipes 1 (press the key to unlock it) (BJE/BNX and CCNA engine).
- Loosen on the Magnetic valve for activated charcoal tank - N80- the hose connected to the intake manifold.
- Seal pipes so that no dirty comes into the fuel supply system.
- Remove the crankcase ventilation pipes and Cold start valve - N17- of the air filter
- Remove crankcase ventilation pipes from the air filter (CPBA engine).
- Follow cleaning rules ➔ [page 127](#) .
- Drain cooling system ➔ [page 110](#) .
- Loosen transmission gearshift mechanism: ➔ Power transmission; Rep. gr. 34 ; Drive housing .
- Remove clutch operating receptor cylinder: ➔ Clutch and gearbox; Rep. gr. 30 ; Clutch - command system .



#### Note

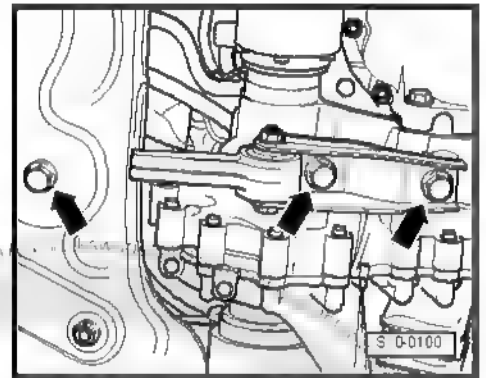
*Clutch pedal must not be activated.*

- Loosen or disconnect the following components:
  - ◆ Remove the brake servo valve with the aid of the Pliers - AG3392- .
  - ◆ Hose for Cold start valve - N17- on throttle housing.
  - ◆ Connector for Intake manifold pressure sensor - G71- and Air intake temperature sensor - G42-
  - ◆ Connector for the Ignition transformer - N152- , Sensor Hall - G40- and Throttle valve control unit - J338- .
  - ◆ Connector for the Ignition Coils, of Sensor Hall - G40- , and Throttle valve control unit - J338- (CBPA engine).
  - ◆ Connector for the Coolant temperature sensor - G62- and the Oil pressure switch - F1- .
  - ◆ Injection valve connectors.
  - ◆ Lambda probe - G39- connector.
  - ◆ Remove the upper and lower cooling system hoses from the coolant expansion tank.
  - ◆ Loosen the upper radiator hose.
  - ◆ Remove the expansion valve hoses ➔ Heating, ventilation, air conditioning; Rep. gr. 87 ; Air conditioning .
  - ◆ Remove the front wheels.
  - ◆ Remove the left and right protector for the front wheel housings.
  - ◆ Remove the engine compartment lower noise insulation ➔ General body repairs, exterior; Rep. gr. 50 , Body - Front section .
  - ◆ Loosen the lower radiator hose.
  - ◆ Remove the Poly-V belt ➔ [page 24](#) .
  - ◆ Remove the power steering oil pump and put it aside, together with the local hoses, without disconnecting the hoses ➔ Chassis, axles, steering; Rep. gr. 48 ; Steering .



- ◆ Connector for the Engine speed sensor - G28- (next to the intake manifold).
- ◆ 2-pole connector for Knock sensor 1 - G61- (intake manifold side).
- ◆ Loosen the engine harness from the brackets and support it on the front end
- ◆ Remove/disconnect and release all gearbox electric cables, Starter - - Generator (Alternator) - - and air conditioning compressor.
- ◆ Remove the negative cable that connects the left front longitudinal member transmission from the longitudinal member.
- ◆ Disconnect the connector for the Lambda Probe after the catalyst - G130- .
- ◆ Remove front exhaust tube. ⇒ [page 187](#) .
- Install front end in the service position ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - Front section .
- Remove the pendulum support -arrows-.

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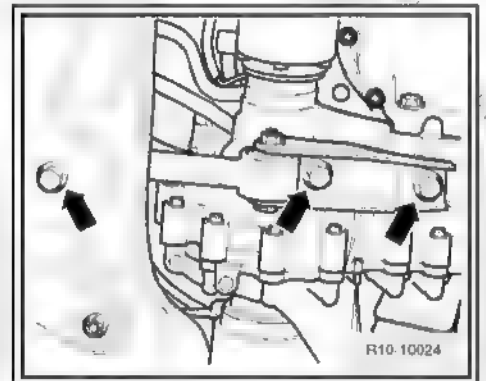
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Vehicles with air conditioning

- Remove air conditioning compressor ⇒ Heating, ventilation, air conditioning; Rep. gr. 87 ; Air conditioning (without disconnecting the hoses).
- Observe additional indications and installation works ⇒ [page 17](#) .

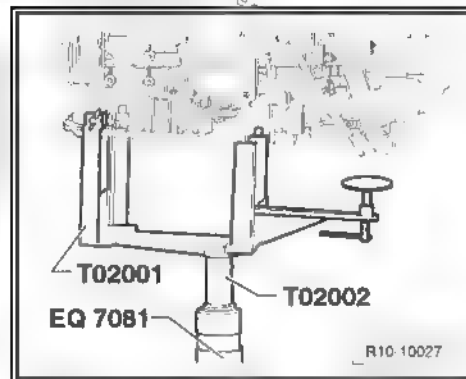
Continued for all vehicles:

- Remove the Generator (Alternator) - C- .
- Remove the power steering hydraulic oil pump anchoring bracket, Generator (Alternator) - C- and air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioning .
- Loosen right and left drive shafts on gearbox and fasten them to the body ⇒ Chassis, axles, steering; Rep. gr. 40 ; Front suspension .

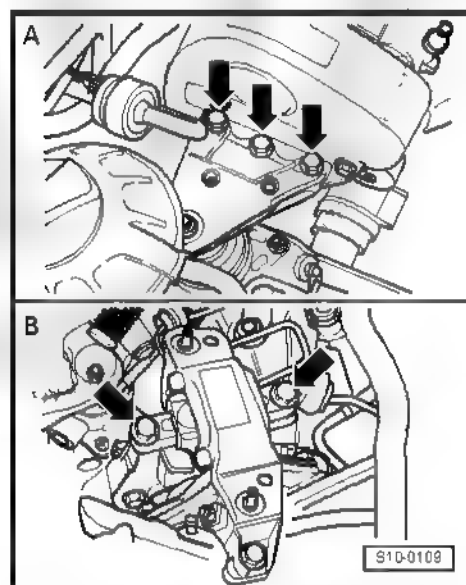




- Support engine and gearbox with the Gearbox or engine + gearbox assembly jack or VAG 1383A - EQ 7081- , Device - T02001- and Glove - T02002-
- Remove the screws from the gearbox support -B--arrows- and from the engine's support -A--arrows-

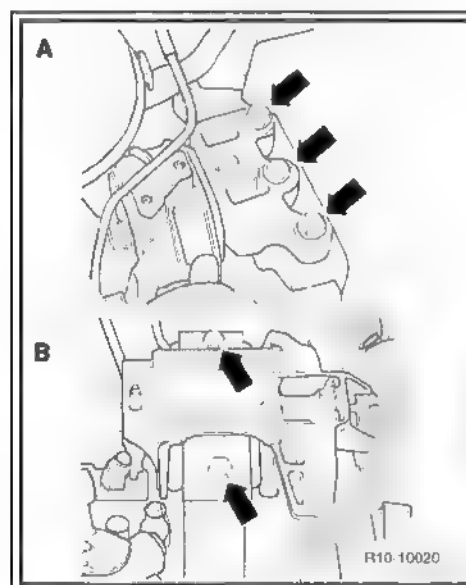


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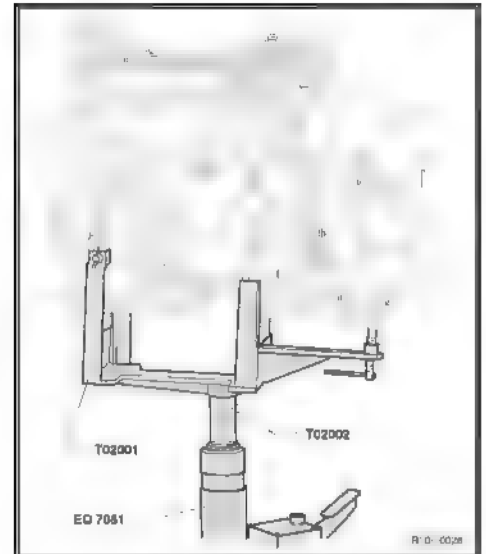
- Lower the set enough to free it from the gearbox mount so there is no interference by the selector mechanism and the constant-velocity joint.
- Displace the engine and gearbox assembly to the front.







- Remove the engine and gearbox assembly.
- Install lifting eyelets on the cylinder head. Tightening torque 25 Nm.



- Fasten with the Lifting tackle - 2024A- as described below and raise it slightly with the hoist:

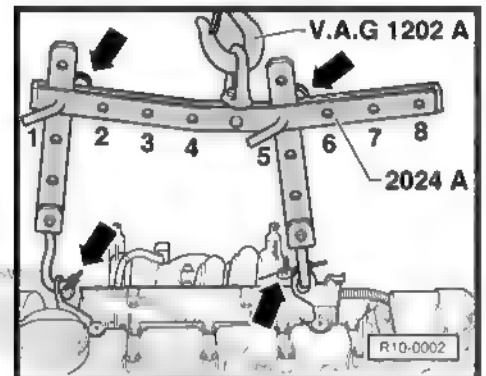
Pulley side: position -3- of the vertical rod. Orifice on the sustaining bar in position -1-.

Flywheel side: position -3- of the vertical rod. Orifice on the sustaining bar in position -5-.



#### WARNING

*Use safety locks on the hooks and pins -arrows-*



#### Note

- ◆ Positions numbered -1...8- on the lifting bar are ordered from the pulley side.
- ◆ The holes in the supports are counted from the hook.

## 1.2 Engine - fasten to assembly stand

Special tools and workshop equipment required

- ◆ Mount for VW 643 or VW 643/1 - VW 313-
- ◆ Engine and gearbox swivelling stand - VAS 6095-

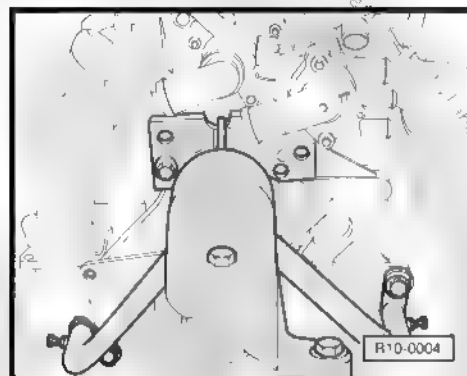


#### Operation sequence

- Separate gearbox from engine.



- Remove flywheel
- Remove intermediate plate
- Fasten the engine with the Support for VW 643 or VW 643/1  
- VW 313- or Rotary stand for engine and gearbox - VAS 6095-



### 1.3 Installation notes

Installation is carried out in the reverse sequence to the removal, considering the following:



#### WARNING

*Whilst working within the engine compartment in particular, due to the limited space available, take the following into account:*

- ◆ *All hoses (e.g. fuel, hydraulics, activated charcoal filter system, cooling system and cooling gas, brake fluid, vacuum) and electric cables must be restored to their original positions.*
- ◆ *Allow easy access to all the moving or hot parts.*

- Check the clutch roller bearing for wear and replace if necessary ⇒ Clutch, gearbox; Rep. gr. 34 ; Drive, housing .
- Clean and lightly lubricate the splines of the input shaft with Grease - G 000 100- .
- If necessary, check that the clutch disc is centralized.
- Check that the guides for coupling the engine and gearbox are placed on the engine block and, if necessary, install them.

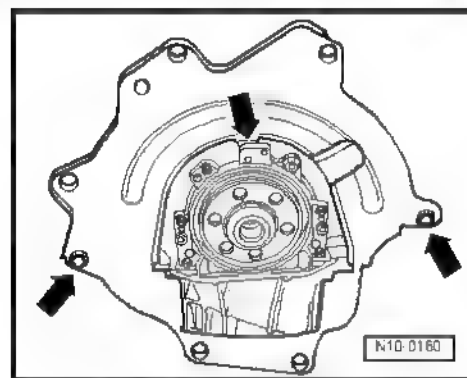


- Install the intermediate plate on the sealing flange and move it towards the sleeves -arrows-.
- When the assembly is installed, make sure the drive shafts pass freely.
- Align the engine, moving it quickly so that the supports fit without tension



#### Note

- ◆ Tightening torque for the assembly ➤ [page 15](#) .
- ◆ The power unit support fastening bolts are expansion bolts and must be replaced whenever loosened or removed.



- Install drive shafts: ➤ Chassis, axles, steering ; Rep. gr. 40 ; Front suspension .

#### Vehicles with air conditioning

- Remove the air conditioning compressor ➤ Heating, air conditioning; Rep. gr. 87 ; Air conditioning .
- Install the Generator (Alternator) - C- .
- Install power steering pump ➤ Chassis, axles, steering; Rep. gr. 48 ; Steering .
- Install Poly-V belt ➤ [page 24](#) .

#### Continued for all vehicles:

- Electrical connections and their arrangement: ➤ Current flow diagrams, Electrical fault finding and Fitting locations .
- Install clutch master cylinder: ➤ Clutch and gearbox; Rep. gr. 30 ; Clutch - command system .
- Install gearshift mechanism: ➤ Power transmission; Rep. gr. 34 ; Drive, housing .
- Install front exhaust pipe onto exhaust manifold ➤ [page 187](#) .
- Install engine compartment lower noise insulation.
- Replenish cooling system ➤ [page 110](#) .
- Remove lifting eyelets from the engine cylinder head.
- Install cooling system pipes on engine cylinder head. Tightening torque: 25 Nm.
- Install air filter ➤ [page 171](#) .
- Adjust the Engine control unit - J623- to the Throttle valve control unit - J338- ➤ [page 182](#) .
- Carry out a test run and check the event memory ➤ [page 183](#) .

## 1.4 Tightening torques

Location		Tightening torque
Bolts, nuts	M 6	10 Nm
	M 8	20 Nm
	M 10	45 Nm
	M 12	60 Nm
Exhaust pipe on the exhaust manifold		40 Nm



Note

Tightening torque for the assembly housing ➔ [page 15](#).



WARNING

Always replace self-locking nuts and bolts subjected to angular torque

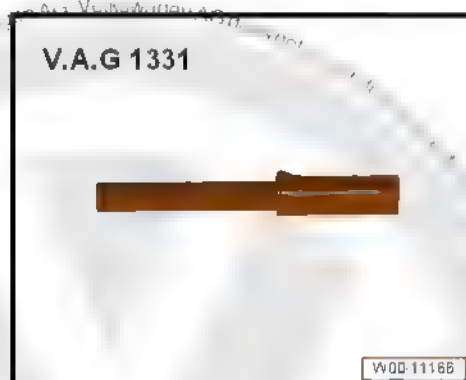
## 1.5 Engine and gearbox support set - align

Special tools and workshop equipment required

- ◆ Support device - 10-222A- and Adapter - 10-222 A/1-



- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-



- ◆ Torque Wrench - 40 to 200 Nm ( 1/2"-drive) - VAG 1332-





#### WARNING

*Before loosening the screws, support the aggregates with the Support device 10-222A-.*

### 1.5.1 Power-drive group supports, engine

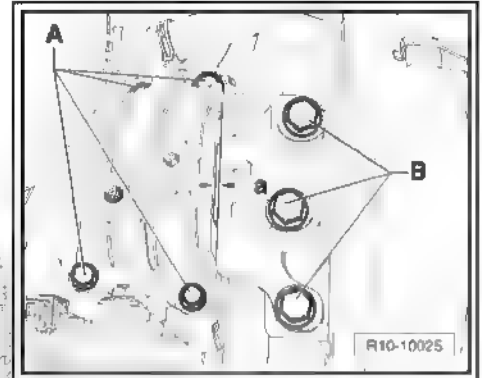
-a = 3.0 mm

- When installing the new bolts -A and B-, in order to prevent the assembly from moving, position first all the bolts, then apply the torque with the Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331- and in the end with an extension bar the angular torque.



#### Note

*Fastening screws -B- of the gearbox mounting must be handled with care when the final torque is applied, so as not to displace the assembly.*



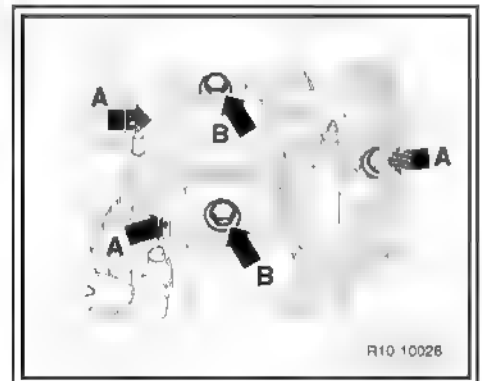
### 1.5.2 Power-drive group supports, gearbox

- When installing the new bolts -A and B-, in order to prevent the assembly from moving, position first all the bolts, then apply the torque with the Torque wrench - 5 to 200 Nm ( 1/2" drive) - VAG 1332- and Torque wrench - 5 a 50 Nm ( 1/2" drive) - VAG 1331- and in the end with an extension bar the angular torque.



#### Note

*Fastening screws -B- of the gearbox mounting must be handled with care when the final torque is applied, so as not to displace the assembly.*



## 1.6 Power-drive group supports (tightening torques)

### 1.6.1 Tightening torques



#### Note

*The power unit support fastening bolts are expansion bolts and must be replaced whenever loosened or removed.*



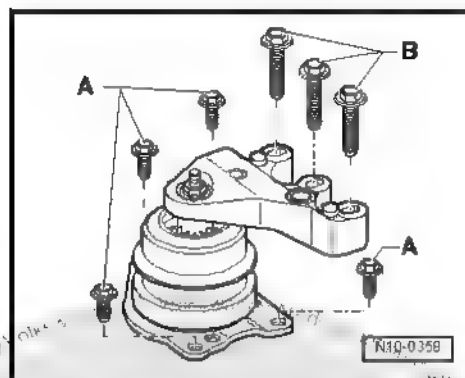
#### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque.*



#### Power-drive group support (engine side):

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◆ A <sup>2)</sup> = 20 Nm + 90°

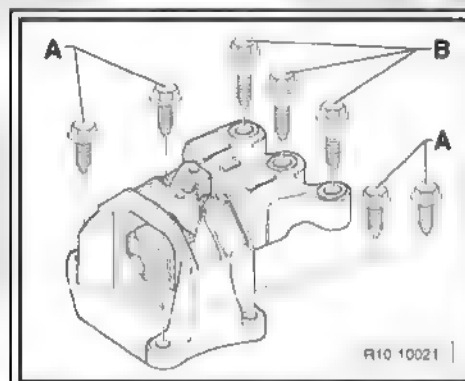
◆ B <sup>2)</sup> = 30 Nm + 90°

2) Replace.

- When installing the new bolts -A and B-, in order to prevent the assembly from moving, position first all the bolts, then apply the torque with the Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331- and in the end with an extension bar the angular torque.

#### Power-drive group support (gearbox side):

Until December 9, 2007



From December 10, 2007

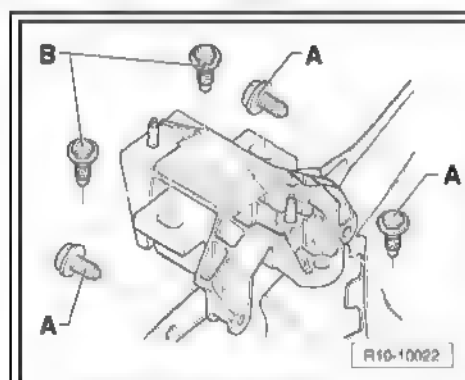
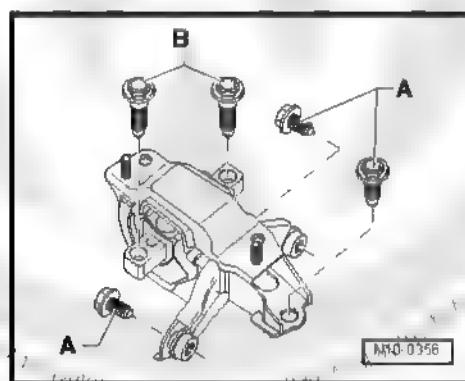
◆ A <sup>3)</sup> = 50 Nm + 90°

◆ B <sup>3)</sup> = 40 Nm + 90°

3) Replace.

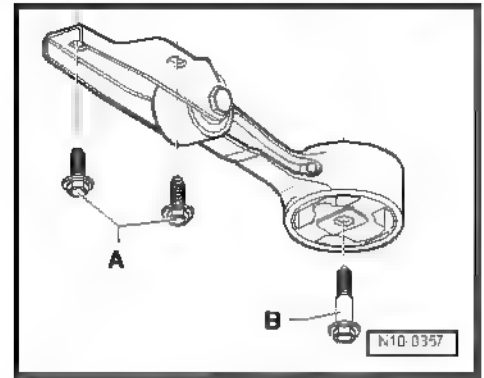
- When installing the new bolts -A and B-, in order to prevent the assembly from moving, position first all the bolts, then apply the torque with the Torque wrench - 5 to 200 Nm ( 1/2" drive) - VAG 1332- and Torque wrench - 5 a 50 Nm ( 1/2" drive) - VAG 1331- and in the end with an extension bar the angular torque.

#### Pendulum support (torque restrictor):





Until December 9, 2007



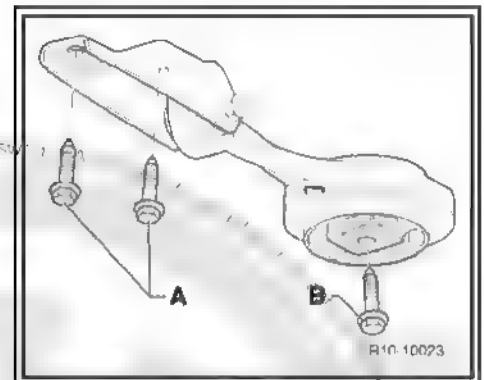
From December 10, 2007

◆ A <sup>4)</sup> = 30 Nm + 90°

◆ B <sup>4)</sup> = 40 Nm + 90°

4) Replace.

- When installing the new bolts -A and B-, in order to prevent the assembly from moving, position first all the bolts, then apply the torque with the Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331- and in the end with an extension bar the angular torque.



## 1.7 Additional notes and installation works in vehicles with air conditioning



### WARNING

*The cooling gas circuit for the air conditioner should not be opened.*



### Note

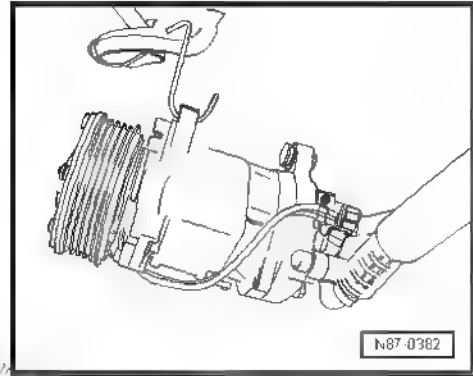
*To avoid damage to the condenser and cooling gas hoses, do not kink, twist nor overstretch the hoses.*

To remove and install the engine without opening the cooling gas loop:

- Remove cooling gas hose clamp(s).
- Remove the Poly-V belt ⇒ [page 24](#) .
- Install front end in the service position ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - Front section .
- Move the panel with radiator and condenser to the front in such a way that the coolant gas hoses are not stretched.
- Remove air conditioning compressor and anchor it to the body ⇒ Heating, air conditioning, Rep. gr. 87 ; Air conditioning .



- Fasten the compressor to the body so that the cooling gas tubes/hoses are not subject to tension







## 13 – Crankshaft group

### 1 Engine - assembly and disassembly



#### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque.*



#### Note

- ◆ *To carry out assembly works, fasten the engine on the assembly stand, using the Support for VW 643 or VW 643/1 - VW 313- or Rotary stand for engine and gearbox - VAS 6095-.*
- ◆ *It is necessary to carefully clean the oil ducts and to replace the oil filter if, when servicing the engine, significant amounts of metal particles and detached particles are found in the oil, due to abrasion or wear resulting from seizing (for instance, from the connecting rods or bearing shells). This procedure prevents any consequential damage.*
- ◆ *All contact and bearing surfaces must be lubricated with oil before assembly works.*





I ⇒ [page 20](#)

II ⇒ [page 22](#)

Part I



1 - Upper cover to mechanical distributor

2 - Toothed belt

- ☐ Mark the spinning direction before the removal.
- ☐ Check for wear.
- ☐ Do not bend.
- ☐ Removal, installation and adjustment ⇒ [page 59](#).

3 - 20 Nm + 90°

- ☐ Replace after each removal.
- ☐ To loosen and tighten, immobilize the camshaft gear with the Special wrench - 3036-.

4 - Camshaft gear

- ☐ Check the fastening during installation.
- ☐ Check the installation position of toothed belt ⇒ [page 59](#).

5 - 10 Nm

- ☐ Install with Liquid sealant - D 000 600 A2-.

6 - Mechanical distribution rear cover

7 - Water pump

- ☐ Replace the sealing gasket if it is damaged.
- ☐ Check that it turns smoothly.
- ☐ Removal and installation ⇒ [page 121](#).

8 - Toothed belt tensioning pulley

- ☐ Check ⇒ [page 58](#).
- ☐ Drive belt removal, installation and adjustment ⇒ [page 59](#).

9 - 23 Nm

10 - 20 Nm

11 - Engine support

12 - Crankshaft gear

- ☐ Check installation position of toothed belt ⇒ [page 59](#).

13 - 50 Nm

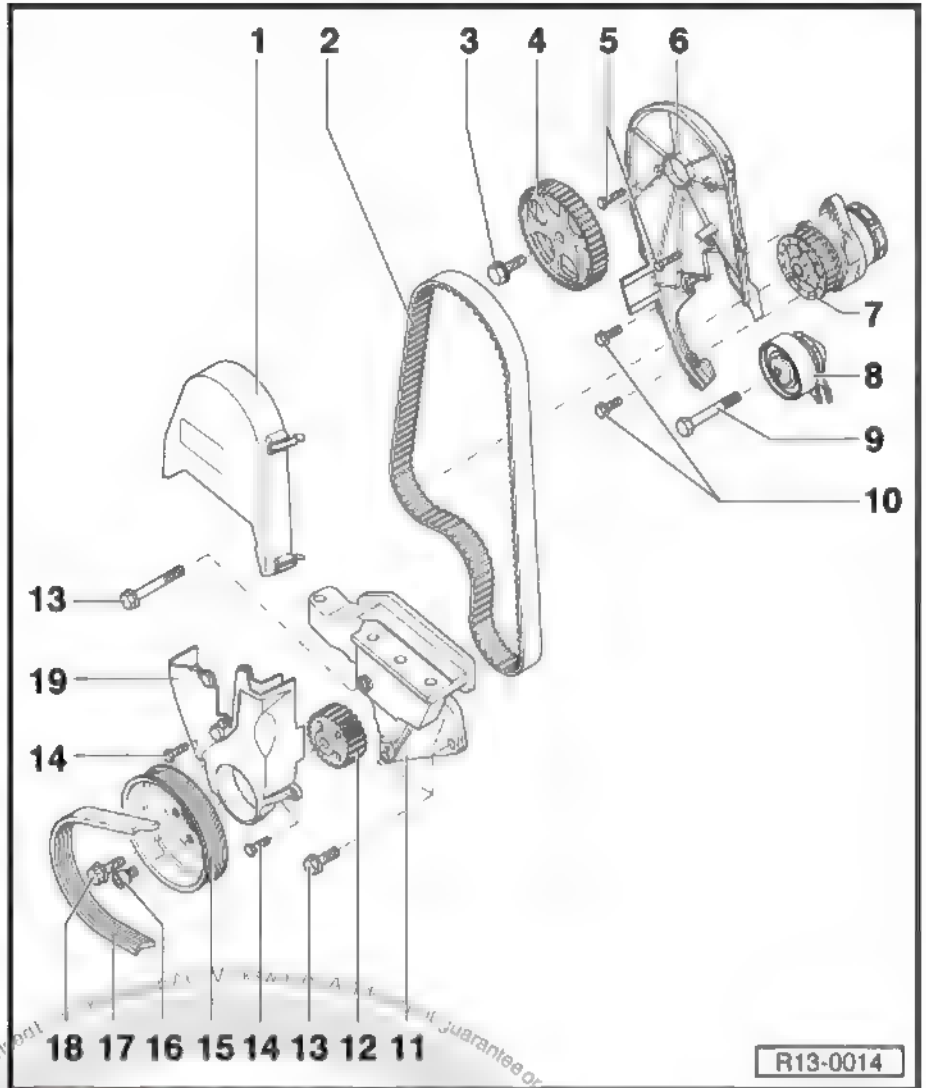
14 - 10 Nm

15 - Crankshaft pulley

- ☐ Check the fastening during installation.
- ☐ Removal and installation ⇒ [page 59](#).
- ☐ Remove and install of Poly-V belt ⇒ [page 24](#).

16 - 15 Nm + 40°

- ☐ Replace after each removal





#### 17 - Poly-V belt

- ☐ Mark the spinning direction before the removal.
- ☐ Remove and install of Poly-V belt ➔ [page 24](#) .
- ☐ Poly-V belt trajectory ➔ [page 27](#) .

#### 18 - 90 Nm + 90°

- ☐ Replace after each removal.
- ☐ To loosen and tighten, use Wrench - 3415- .
- ☐ Tightening continuation can be carried out in several steps.
- ☐ Tightening angle can be measured with a common protractor, for example, Hazet 6690.

#### 19 - Lower cover to the mechanical distributor

### Part II



#### Note

*Clutch repairs: ➔ Clutch and gearbox; Rep. gr. 30 ; Clutch - command system .*



#### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque.*



### 1 - Engine block

- ☐ Removal and installation of the crankshaft ➤ [page 47](#) .
- ☐ Remove and install pistons and connecting rods ➤ [page 50](#) .

### 2 - 50 Nm

- ☐ Tightening sequence. first tighten the upper right screw, then the lower right screw, and finally the left screw (front view, in the direction the vehicle moves).

### 3 - Oil filter

- ☐ Replace ➤ [page 94](#) .

### 4 - Bolt

- ☐ M8 = 20 Nm + 90° (replace)
- ☐ M10 = 45 Nm

### 5 - 15 Nm

- ☐ Loosen fastening screws from the engine block crankcase, on the pulley side (4 units), from inner side of the crankcase.

### 6 - Crankcase

- ☐ Clean sealing surfaces before installation.
- ☐ Install with Silicone sealant for engines - D 176 404 A2 ou A3- .

- ☐ Removal and installation ➤ [page 93](#) .

### 7 - Oil draining plug, 30 Nm

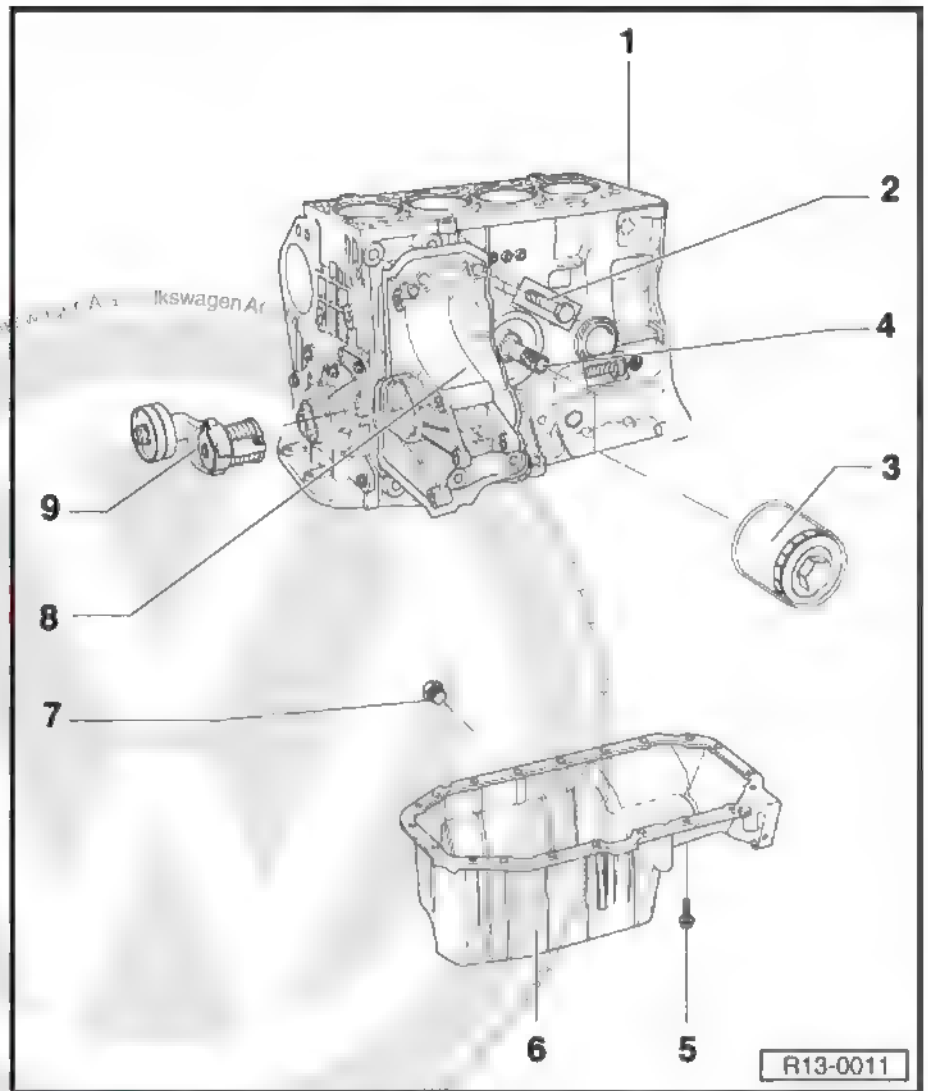
- ☐ With integrated sealing ring.
- ☐ Replace.

### 8 - Compact support

- ☐ For air conditioning compressor, Generator (Alternator) - C- , power steering oil pump and Poly-V belt fastening element.
- ☐ Remove and install the compact support in vehicles with air conditioning: ➤ Heating, air conditioning; Rep. gr. 87 ; Air conditioning .

### 9 - Tensor pulley

- ☐ For Poly-V belts.
- ☐ Not applied to the (elastic) Poly-V belt.
- ☐ For vehicles with air conditioning only.
- ☐ To loosen Poly-V belt, turn with 16-mm wrench.
- ☐ Remove and install of Poly-V belt ➤ [page 24](#) .

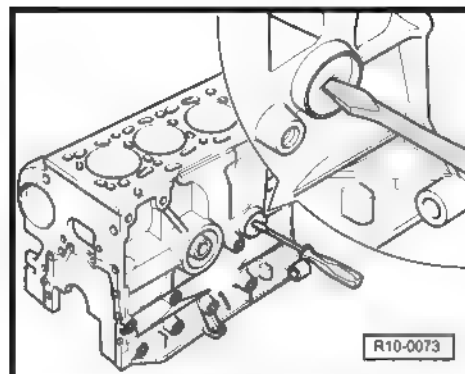




## 1.1 Seal lid - replace

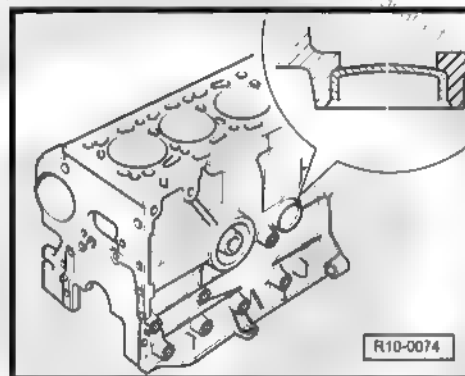
### 1.1.1 Removal

- Removal must be executed with a screwdriver after boring with a chisel



### 1.1.2 Installation

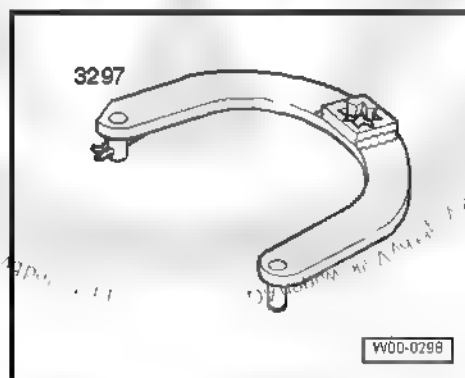
- Installation must be carried out with a driftpin in the cover diameter and depth must be kept at the bevel height. Upon installation, apply adhesive ⇒ Chemicals Manual.



## 1.2 Poly-V belt - remove and install

Special tools and workshop equipment required:

- ◆ 16-mm wrench
- ◆ Lever - 3297- or -VW 5329/7-





- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-

#### V.A.G 1331



W00-11166

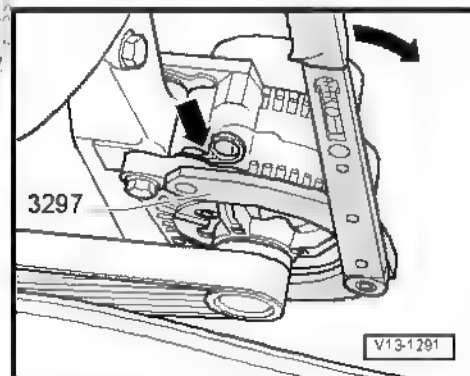
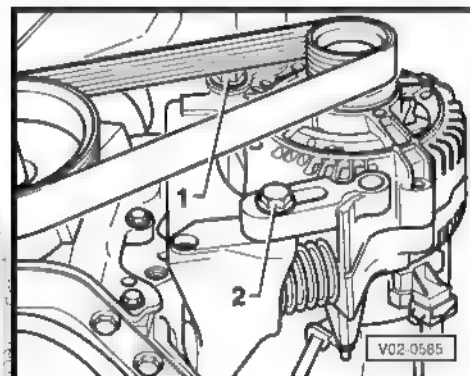
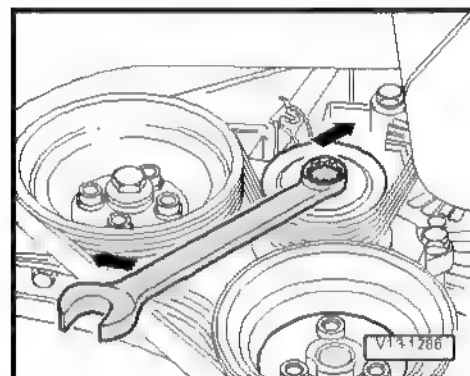
## 1.2.1 Removal

### Vehicles with air conditioning

- Remove lower noise insulation from engine compartment.
- Mark the Poly-V belt running direction.
- To release the Poly-V belt, turn the belt tensioning element in direction of the -arrows-, using a 16-mm wrench .
- Remove the Poly-V belt.

### Vehicles without power steering and air conditioning

- Mark the Poly-V belt running direction.



- Loosen the fastening screws -1- and -2- of the Alternator -- , at least by one turn.

- Place the Lever - 3297- or -VW 5329/7- , lock with fitting pin and rotate the Generator (Alternator) - C- downwards (with the Lever - 3297- operation, use, for example, the torque wrench).
- Remove the Poly-V belt



## 1.2.2 Installation



### Note

- ◆ Before installing the Poly-V belt, make sure all aggregates (Generator (Alternator) - C-, air conditioner compressor and power steering pump) are firmly installed.
- ◆ While installing the Poly-V belt, observe the proper moving direction and seating of the belt on pulley.

#### Vehicles with air conditioning

- First, place the Poly-V belt on the crankshaft pulley. Then, place the belt on the tensioning element.

Installation is performed in reverse sequence to the removal.

When the job is finished, always:

- Start the engine and check the belt motion.

#### Vehicles without power steering and air conditioning

- Press the Generator (Alternator) - C- up to the tensioning spring stop with the Lever - 3297- at least three times, to ensure correct belt seating.
- Then press the Generator (Alternator) - C- with the Lever - 3297- against the belt tensioner until the Poly-V belt can be installed on the pulley.
- After placing the Poly-V belt, turn the engine several times with the Generator (Alternator) - C- still loose (approx. 11 revs.). To do this, briefly run the starter - B<sub>2</sub> -.



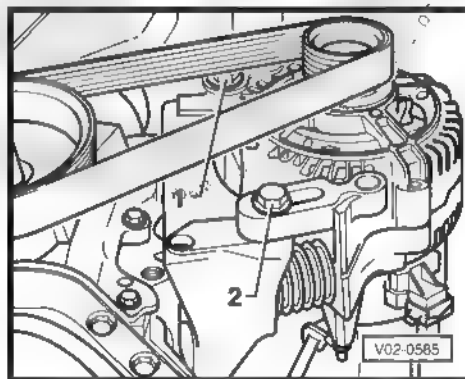
### Note

When tightening the Generator (Alternator) - C- bolts, observe the tightening sequence and do not touch the Poly-V belt.

- First tighten the fastening screw -2- to 25 Nm, then the fastening screw -1- to 25 Nm.

After completing the works:

- Start the engine and check the belt motion.



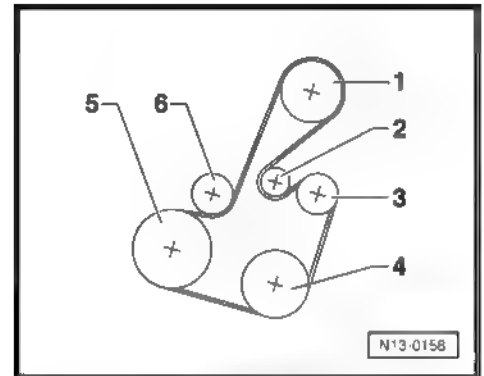




### 1.2.3 Poly-V belt - routing

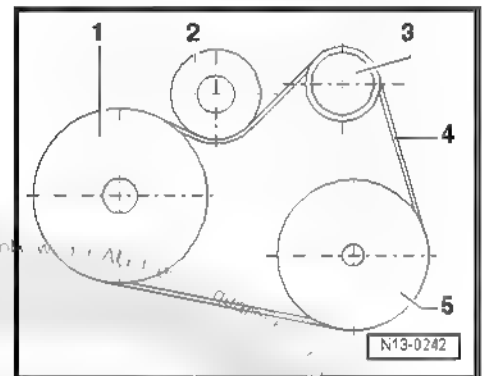
Vehicles with air conditioning and power steering

- 1 - Power steering oil pump pulley
- 2 - Idler roller
- 3 - Generator (Alternator) pulley - C-
- 4 - Air conditioning compressor pulley.
- 5 - Crankshaft pulley.
- 6 - Tensioning roller.



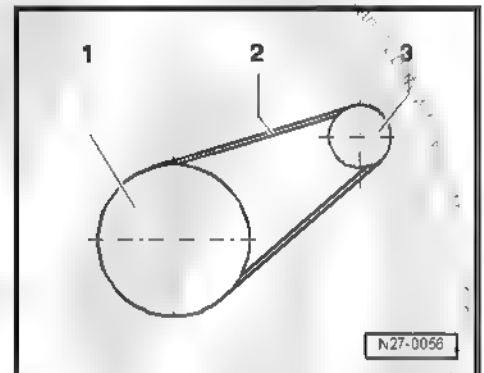
Vehicles without air conditioning and with power steering

- 1 - Crankshaft pulley.
- 2 - Tensioning roller.
- 3 - Generator (Alternator) pulley - C-
- 4 - Poly-V belt.
- 5 - Power steering oil pump pulley.



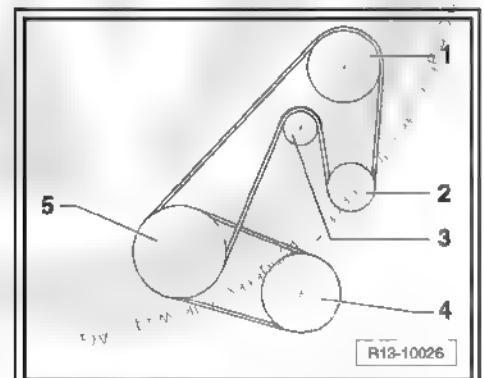
Vehicles without air conditioning and power steering

- 1 - Crankshaft pulley.
- 2 - Poly-V belt.
- 3 - Generator (Alternator) pulley - C-



Vehicles with air conditioning and power steering (spring belt).

- 1 - Power steering oil pump pulley.
- 2 - Generator (Alternator) pulley - C-
- 3 - Idler roller.
- 4 - Air conditioning compressor pulley.
- 5 - Crankshaft pulley.





### 1.3 Poly-V belt (elastic) - remove and install

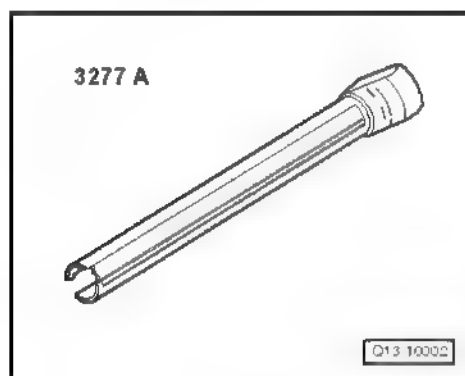


#### WARNING

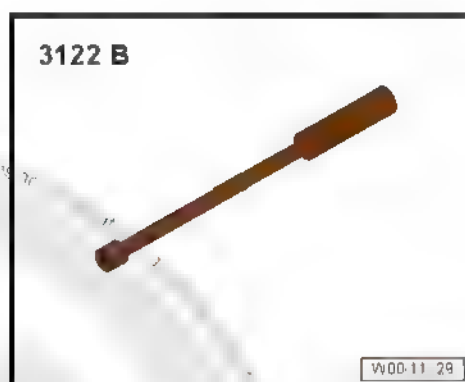
*Replace the elastic Poly-V belt with useful life equal to or over 60,000 km only with jobs that involve its removal.*

Special tools and workshop equipment required

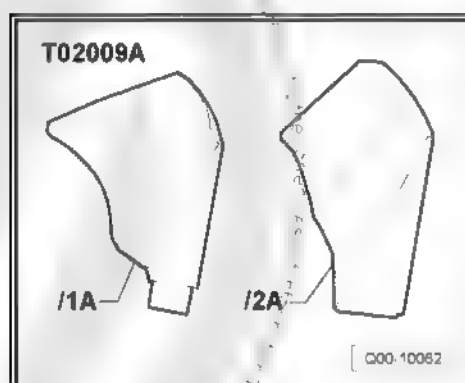
◆ Assembly tool - T10029-



◆ Spark plug wrench - 3122B-

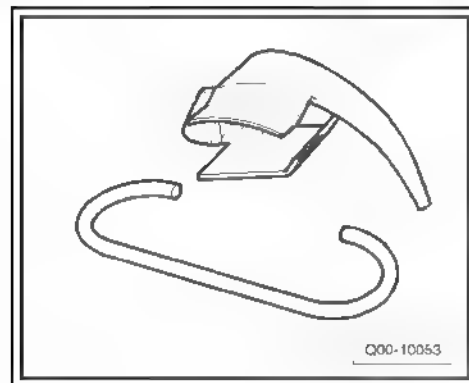


◆ Puller - T02009A-





◆ Assembly tool and Hook



Note

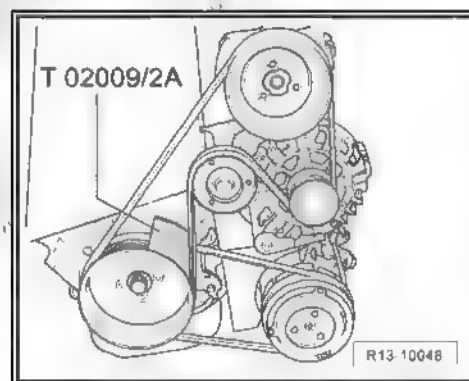
- ◆ The belt installing tools will be supplied together with the respective replacement belts.
- ◆ For larger belts, the assembly tool, and for smaller belts (air conditioning compressor), the hook in addition.
- ◆ Upon belt removal, do not forget to mark its running direction, to be followed upon installation.

Generator (Alternator) - C- and power steering oil pump Poly-V belt (elastic)

### 1.3.1 Removal

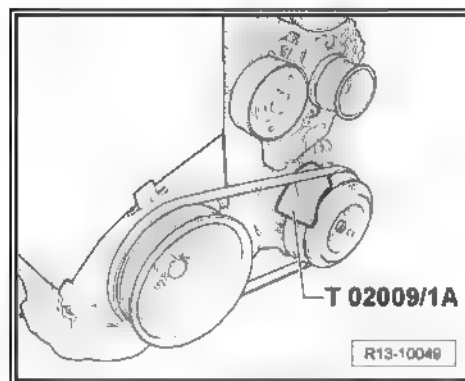
- Remove the spark plug connectors using the Assembly tool - T10029- .
- disconnect the connectors from the Ignition coils with final output stage (CPBA engine).
- Remove the spark plugs using the Spark plug wrench - 3122B- .
- Remove the Ignition coils with final output stage (CPBA engine).
- Remove the spark plugs using the Spark plug wrench - 3122B- .
- Remove right front wheel case cover: ⇒ General outer body assembly jobs; Rep. gr. 66 ; External equipment .
- Install the Puller - T02009/2A- between the Poly-V belt and the crankshaft pulley.
- Turn the crankshaft slowly clockwise until the Puller - T02009/2A- begins displacing the belt.
- Remove the belt together with the Puller - T02009/2A- .

Air conditioning compressor Poly-V belt (elastic)





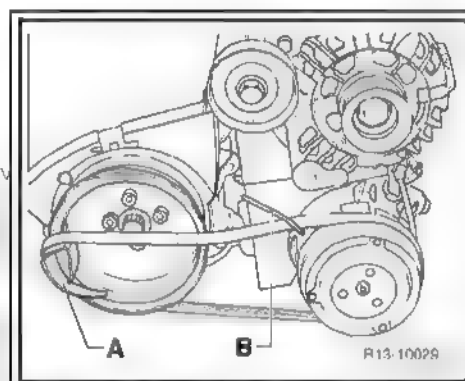
- Install the Puller - T02009/1A- between the Poly-V belt and the air conditioning compressor pulley
- Turn the crankshaft slowly clockwise until the belt is displaced together with the Puller - T02009/1A- .



### 1.3.2 Installation

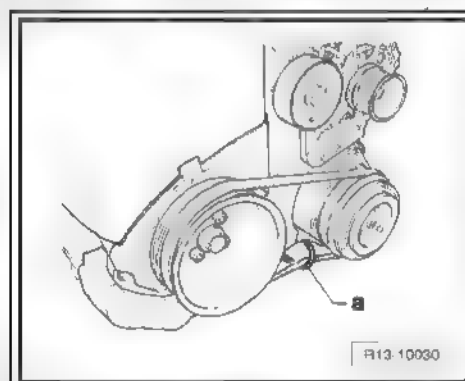
#### Air conditioning compressor Poly-V belt (elastic)

- Install the Poly-V belt (elastic) on the air conditioner compressor pulley and crankshaft pulley, together with the Assembly tool -A-.
- Install Hook -B- in the upper section of the Poly-V belt.
- Turn the crankshaft slowly clockwise until the Poly-V belt is completely installed.
- Remove the Assembly tool and the Hook .



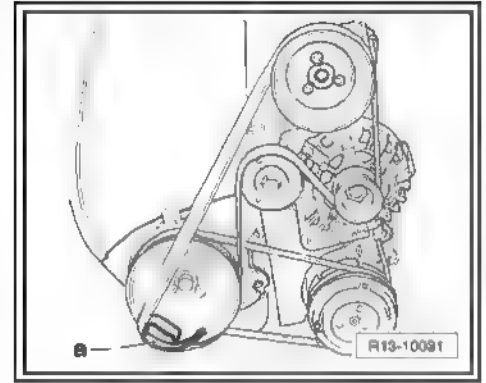
- Install Hook -a- in the lower section of the Poly-V belt.
- Turn the crankshaft slowly clockwise until the Poly-V belt is completely installed.
- Take care that the Poly-V belt is perfectly installed, both on the crankshaft pulley and on the air conditioning compressor pulley.
- Remove Hook -a- from the lower section of the Poly-V belt.

#### Generator (Alternator) - C- and power steering oil pump Poly-V belt (elastic)





- Install the Poly-V belt on the Generator (Alternator) - C- , power steering oil pump, return and crankshaft pulleys, together with the Assembly tool -a-.
- Turn the crankshaft slowly clockwise until the Poly-V belt is completely installed
- Make sure that the Poly-V belt is perfectly installed on the crankshaft, Generator (Alternator) - C- and power steering oil pump pulleys
- Install the right front wheel case cover ⇒ General outer body assembly jobs; Rep gr. 66 ; External equipment .
- Install the Ignition coils with final power stage (CPBA engine)
- Install the Spark plugs - Q- with the Spark plug wrench - 3122B- .
- Connect the connectors of the Ignition coils with final power stage (CPBA engine).
- Install the Spark plug connectors - P...- with Assembly tool - T10029- .





## 2 Crankshaft and flywheel flanges - remove and install



### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque.*



### Note

*Clutch repairs: ➔ Clutch and gearbox; Rep. gr. 30 ; Clutch - command system .*

1 - 10 Nm

2 - Oil suction tube

- ☐ For the metallic tube, the sealing joint must be replaced upon removal and installation.
- ☐ For the plastic tube, the sealing ring does not need to be replaced upon removal and installation.

3 - Engine block

- ☐ Disassembly and assembly of the crankshaft ➔ [page 47](#) .
- ☐ Disassembly and assembly of the pistons and connecting rods ➔ [page 50](#) .

4 - Knock sensor 1 - G61-

5 - 20 Nm

- ☐ Tightening the torque influences the operation of the Knock Sensor 1 - G61- .

6 - 60 Nm + 90°

- ☐ Replace after each removal.

7 - Flywheel

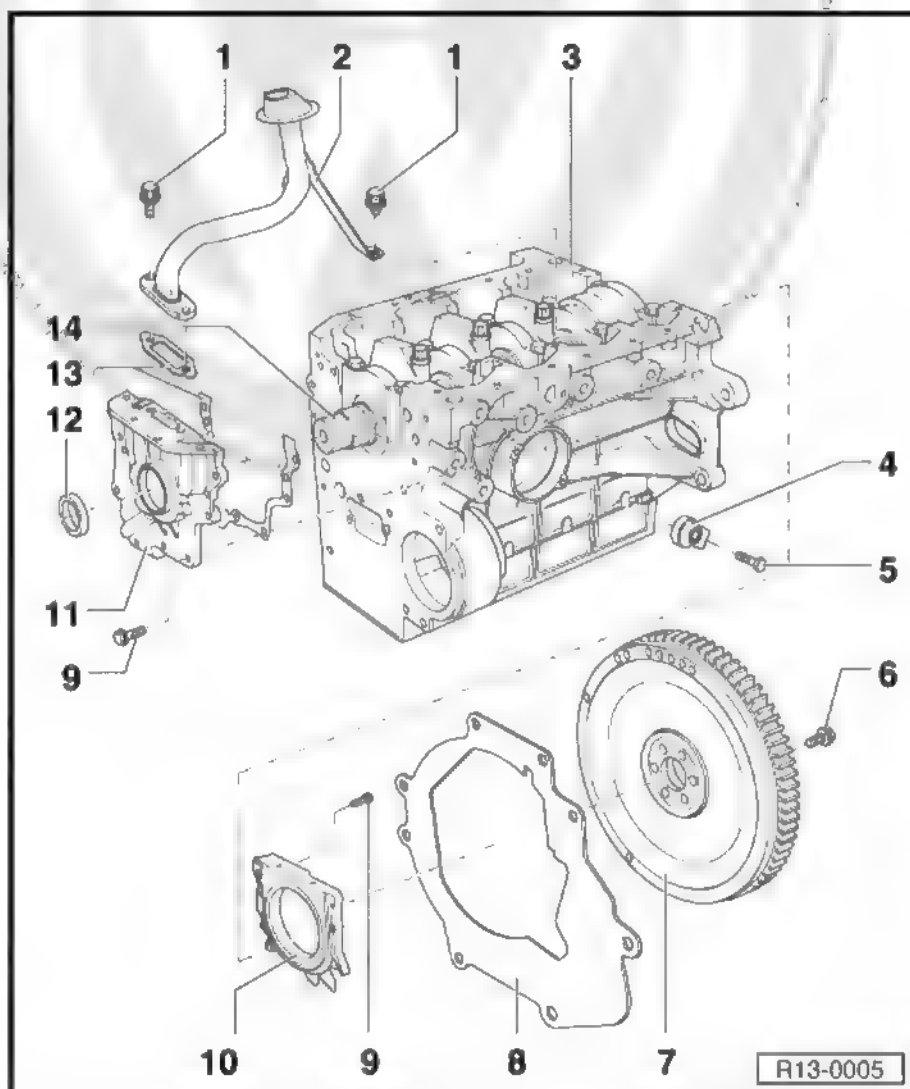
- ☐ For removal and installation of the flywheel, immobilize it with the Lock - VW 3067- or Lock - 3067- .

8 - Intermediate plate

- ☐ It must be seated on the coupling guides.
- ☐ Do not damage/bend during installation.

9 - 6 Nm + 40°

- ☐ Replace after each removal





10 - Crankshaft flange with Engine speed sender - G28- rotor and oil seal (flywheel side)

- ☐ Always replace completely with Engine speed sender - G28- rotor and oil seal.
- ☐ Use the support sleeve supplied for installation.
- ☐ To remove and install, remove oil pan
- ☐ Do not lubricate nor apply oil on the sealing lip of sealing ring.
- ☐ Before installation, remove oil residues from crankshaft trunnion with a clean cloth.
- ☐ The support sleeve will only be able to be removed after moving the flange over the crankshaft trunnion
- ☐ Removal and installation of the flange ➤ [page 36](#) .

11 - Crankshaft flange/oil pump (pulley side)

- ☐ Replace complete only.
- ☐ It must be seated on the guides.
- ☐ To remove and install, remove oil pan.
- ☐ Pay careful attention to the position of the crankshaft trunnion during installation,  
⇒ [Item 14 \(page 33\)](#) .
- ☐ Removal and installation of the oil pump ⇒ [page 96](#) .

12 - Crankshaft seal (pulley side)

- ☐ Replace ⇒ [page 34](#) .

13 - Sealing gasket

- ☐ Replace.

14 - Crankshaft trunnion

- ☐ Apply oil before installing the oil pump.

## 2.1 Flywheel - remove and install

### Special tools and workshop equipment required

- ◆ Immobiliser - 3067-



### Removal

- Gearbox removed.



- Install the Lock - 3067- in the cylinder block; position -B-.
- Remove the fastening bolts from the flywheel.
- Remove flywheel.

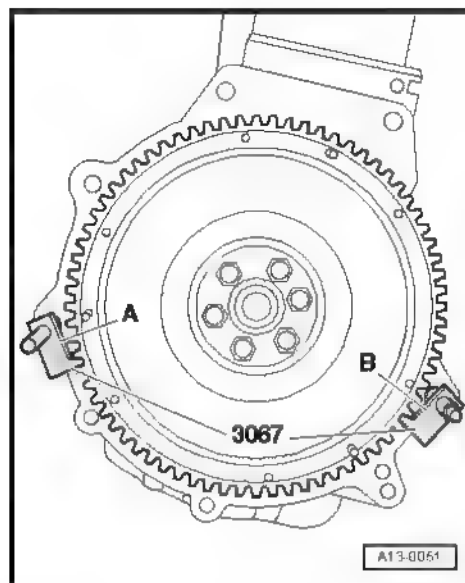
#### Installation

Installation is performed in reverse to removal sequence, considering the following:



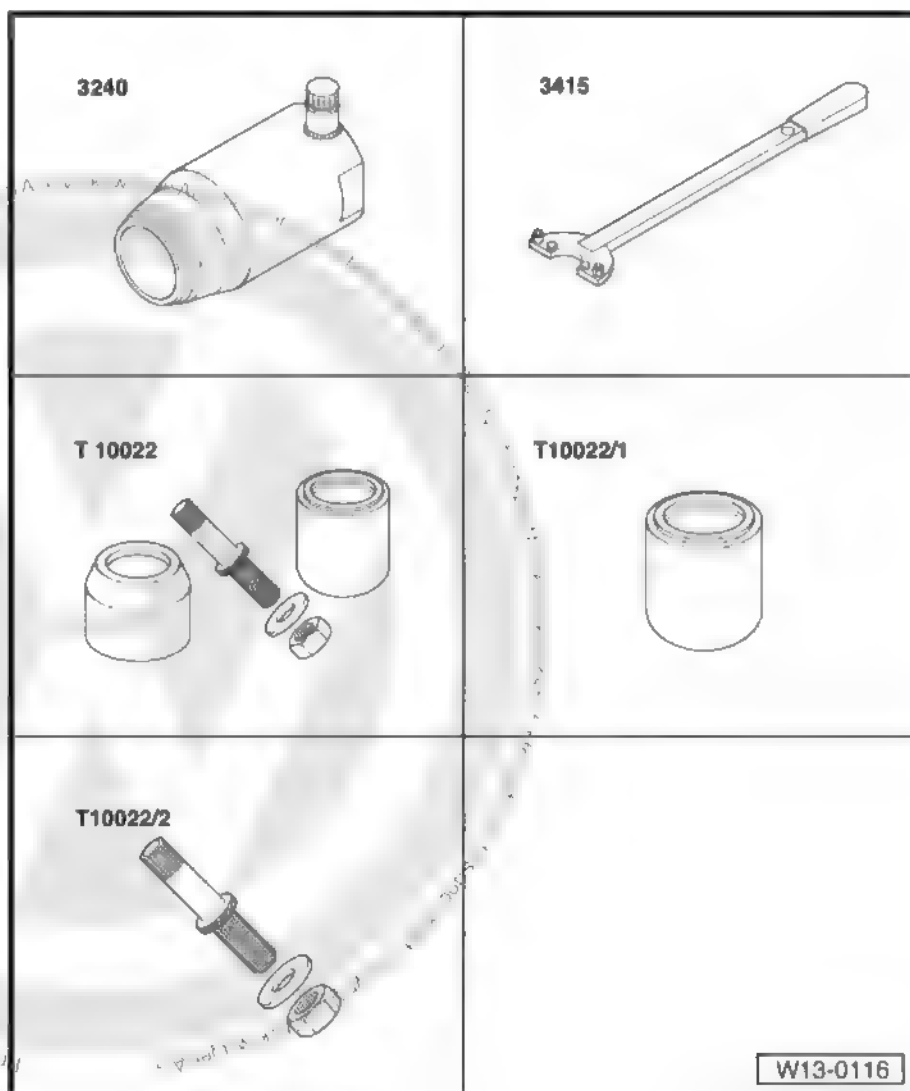
#### Note

- ◆ *Replace the fastening bolts submitted to angular torque.*
- ◆ *The flywheel may only be installed in one position.*
- Install the flywheel and fastening bolts.
- Install the Lock - 3067- in the cylinder block; position -A-.
- Apply the indicated torque to the flywheel fastening bolts  
⇒ [Item 6 \(page 32\)](#)



## 2.2 Crankshaft seal (pulley side) - replace

Special tools and workshop equipment required



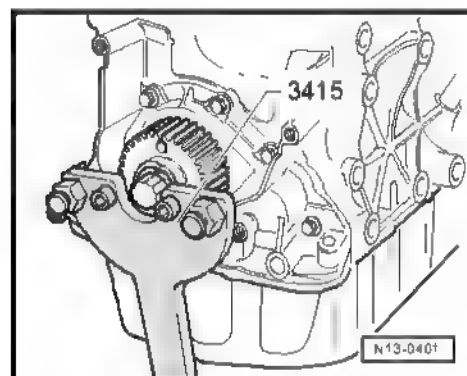




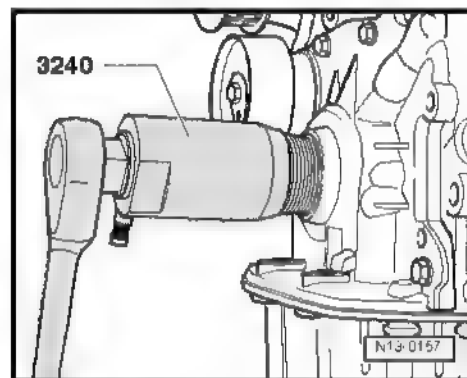
- ◆ Puller - 3240-
- ◆ Wrench - 3415-
- ◆ Assembly sleeve - T10022-
- ◆ Sleeve - T10022/1-
- ◆ Spindle - T10022/2-

### 2.2.1 Removal

- Release the tensor pulley and remove the toothed belt from the crankshaft sprocket ⇒ [page 59](#) .
- Remove crankshaft gear. For this purpose, immobilize the gear with the Wrench - 3415- .
- To guide the seal Extractor - 3240- install the gear fastening screw to the crankshaft stop.
- Turn the inner part of the Extractor - 3240- twice (approx. 3 mm) from the external part, and lock it with the splined screw.

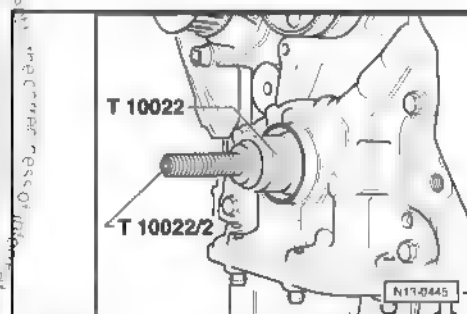


- Lubricate the threaded head of the Puller - 3240- , install it and screw it applying as much force as possible to the seal.
- Loosen the splined bolt and turn the inner part against the crankshaft until the seal is extracted.



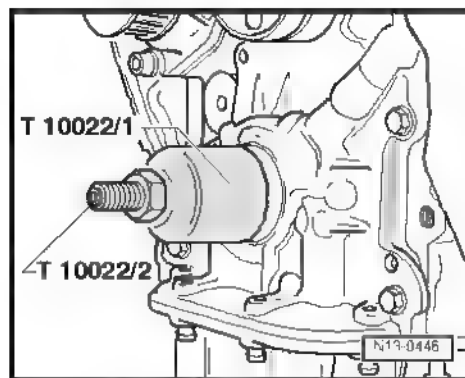
### 2.2.2 Installation

- Quickly lubricate the sealing lip of the seal with oil.
- Apply the Assembly sleeve - T10022- on the crankshaft journal and screw with threaded part up to the stop.
- Displace the seal through the guide sleeve.

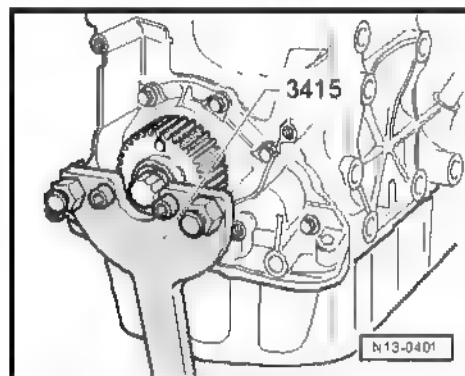




- Compress the seal with the Sleeve - T10022/1- to the stop.



- Install the crankshaft gear and immobilize with the Spanner - 3415- .
- Tighten new screw to 90 Nm and turn it 90° further (there may be several stages of tightening).
- Install the toothed belt and adjust the distribution times  
⇒ [page 59](#) .



## 2.3 Crankshaft flange (flywheel side) - replace



### Note

- ◆ *New flange with sealant with low wear characteristics, installed from the 2nd half of December 2011.*
- ◆ *Interchangeable with the front flange for the CCNA engine.*
- ◆ *Not interchangeable with the front flange for the CPBA engine.*

Special tools and workshop equipment required

- ◆ 24 mm Spanner insert - VAG 1332/11-





- ◆ Depth calliper - 1/20 - 300 mm - VAS 6082-

**VAS 6082**



W00-11204

- ◆ Fitter - T10134- or Fitter - T10017K-

**T10134**



W00-11194

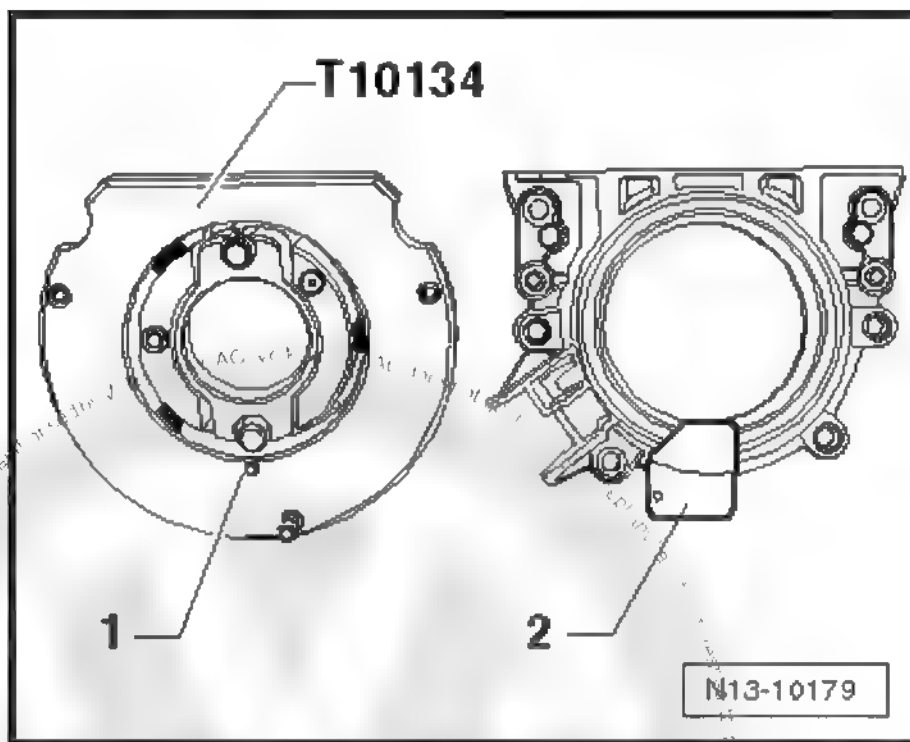
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-

**V.A.G 1331**



W00-11166

- ◆ Feeler gauge
- ◆ Three hexagonal head screws M 6×35 mm



◆ Fitter - T10134-



#### Note

- ◆ For SABO flange, use Fitter - T10017- or Fitter - T10017K- , and for Freudenberg flange, use Fitter - T10134- . The method is the same for both tools. Location of references on the tool for installing the flange with rotor: SABO, upper part and Freudenberg, lower part.
- ◆ Starting with engine BNX 175513, Freudenberg flanges require the Fitter - T10134- or Fitter - T10017K- to be installed. The installation reference is of the upper part, as with the SABO.

### 2.3.1 Crankshaft flange with Engine speed sensor - G28- rotor - remove



#### Note

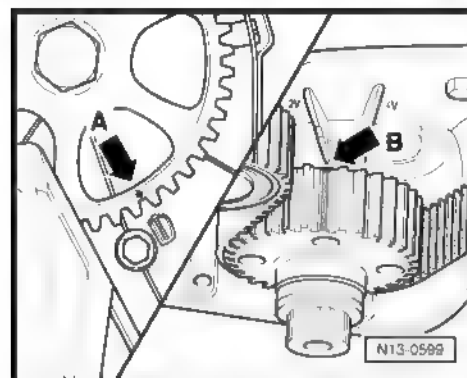
- ◆ To show work sequences better, they were carried out with the engine removed.
- ◆ The work sequences with both engine and gearbox removed are identical

#### Operation sequence

- Remove flywheel
- Remove intermediate plate



- Place the camshaft gear on the mark -arrow A-.
- Place the crankshaft in the cylinder 1 TDC. The chamfered tooth on the crankshaft sprocket must match the "2V" mark on the flange -arrow B-.
- Remove the oil sump ➔ [page 93](#) .

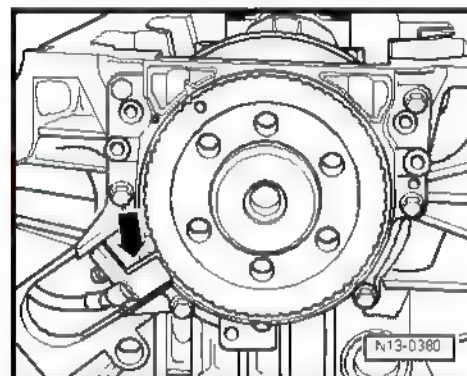


- Remove the Engine speed sensor - G28- -arrow-.
- Loosen flange fastening screws.

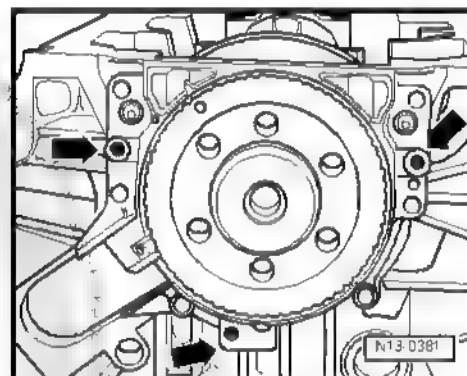


#### Note

*The flange and rotor are removed together from the crankshaft with three screws M 6 × 35 mm.*



- Install the three M 6 × 35 mm screws in the threaded holes of the flange -arrows-.
- Turn the screws alternately (max. one 1/2 turn (180°) per screw) in the flange and remove from the crankshaft the flange with the Engine speed sensor - G28- rotor.





## 2.3.2 Flange with Engine speed sensor - G28-rotor - install



### Note

- ◆ The flange with PTFE sealing ring comes with sealing lip thrust ring. This thrust ring works as an installation sleeve and should not be removed before installation.
- ◆ The flange and the Engine speed sensor - G28- rotor can no longer be separated or turned after being removed from the spare parts packaging
- ◆ The Engine speed sensor - G28- rotor reaches its installation position after being secured to the Fitter fastening pin.
- ◆ The sealing flange and the sealing ring form one unit and can only be replaced together with the Engine speed sensor - G28- rotor.
- ◆ The installation position of the Fitter is relative to the crankshaft by means of a guide pin, which is guided through a threaded hole on the crankshaft.

A - hexagonal nut

B - threaded spindle

C - assembly case

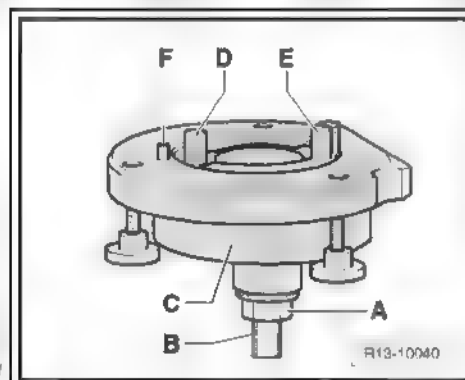
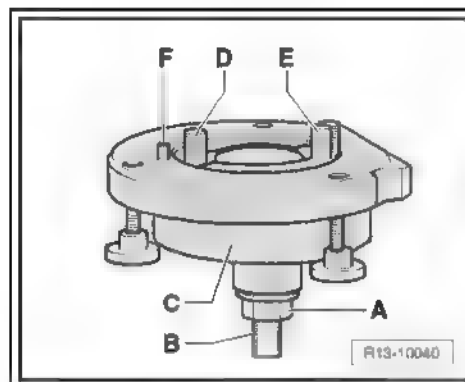
D - Allen screw

E - guide pin

F - fastening pin

A - Flange with the Engine speed sensor - G28- rotor onto Fitter - install

- Install the hex nut -A- to just before the tightening flat surface -B- of the threaded spindle.



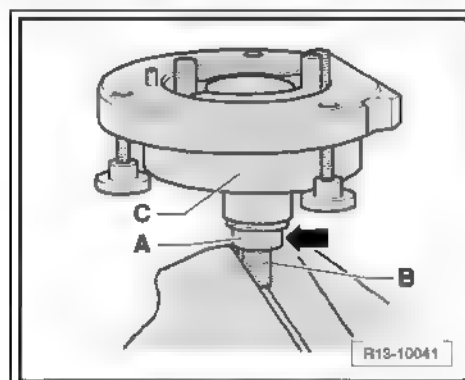
- Fasten the Fitter on the tightening surface -B- of the threaded part in a vise.
- Press the assembly case -C- downwards, so that it lies on the hexagonal nut -A- arrow-.



### Note

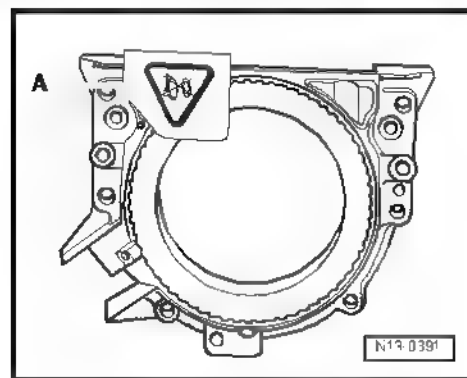
The inner part of the Fitter and assembly housing must be on the same plane.

Freudenberg flange





- Remove the safety clip -A- from the new flange



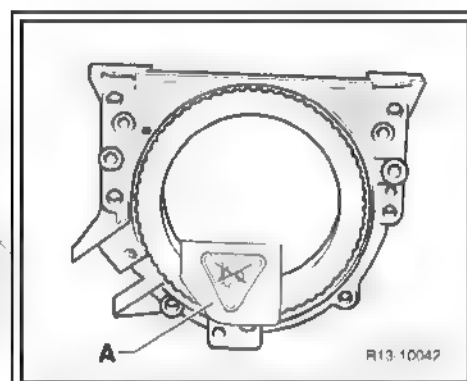
#### Sabó and new Freudenberg flange



#### Note

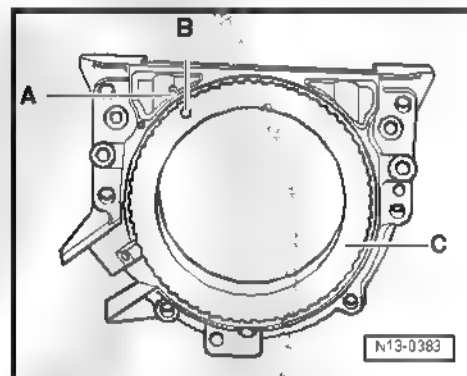
*The Engine speed sensor - G28- rotor cannot be removed from the flange or turned.*

Fastening hole -B- in rotor gear -C- must be aligned with mark -A- on the flange.

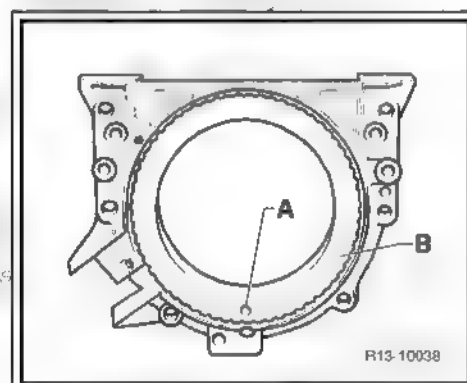


#### Freudenberg flange

#### Sabó and new Freudenberg flange



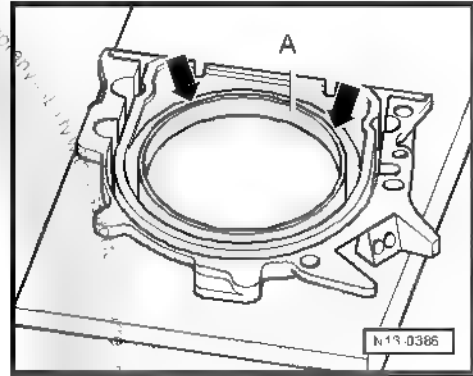
The fastening hole -A- on the rotor gear -B- shall be in the upper centre position of the flange.



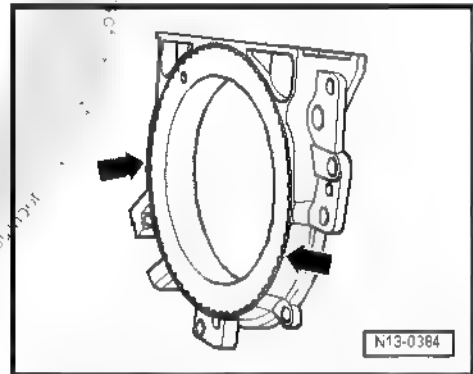


- Place the flange with the front part on a flat and clean surface.
- Press the sealing lip thrust ring -A- downwards in the direction of the -arrow- until it lies on the flat surface.

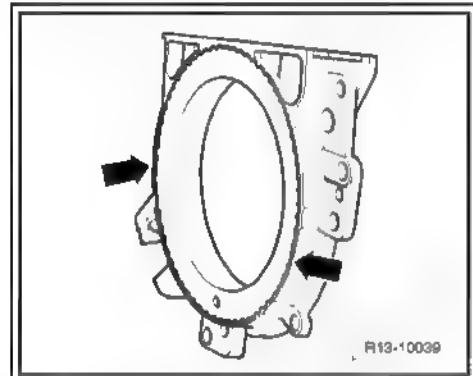
The upper corner of the Engine speed sensor - G28- rotor and the front corner of the flange must be aligned with each other -arrows-



Freudenberg flange



Sabó and new Freudenberg flange

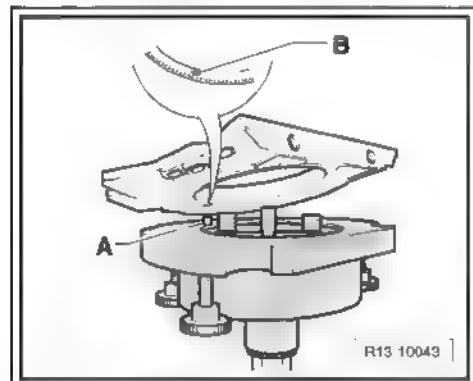


- Place the flange with the front part on the Fitter , in such a way that the fastening pin -A- is inserted into the -B- hole of the Engine speed sensor - G28- rotor.



Note

*Make sure the flange is flat in the Fitter .*







- Press the sealing lip thrust ring -B- while tightening the three splined screws -A- against the Fitter surface, so that the fastening pin can no longer escape from the hole on the Engine speed sensor - G28- rotor.



#### Note

Ensure the Engine speed sensor - G28- rotor remains fastened to the Fitter during flange installation.

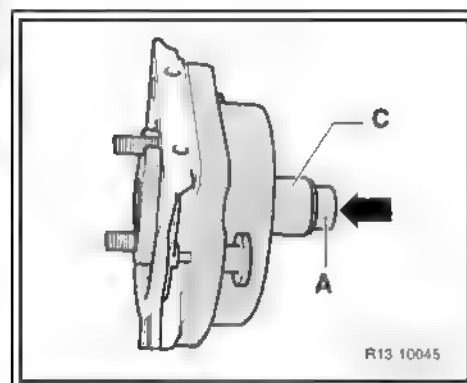
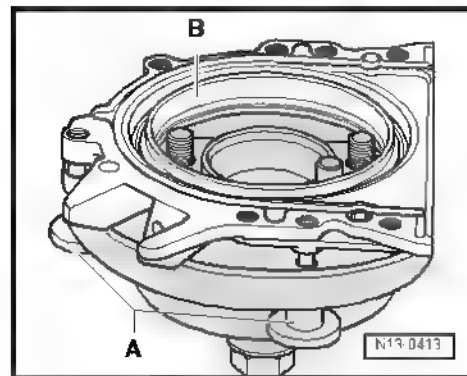
#### B - Fitter with flange onto crankshaft - install

##### Conditions

- The crankshaft flange must be free of oil and lubricants.
- The engine is in TDC for cyl. 1.

##### Operation sequence

- Install the hex nut -A- to the end of the threaded part.
- Press the threaded part of the Fitter in the direction of the arrow until the hex nut -A- touches the assembly housing -C-.
- Align the flat side of the assembly housing with the sealing surface on crankcase side of the block.

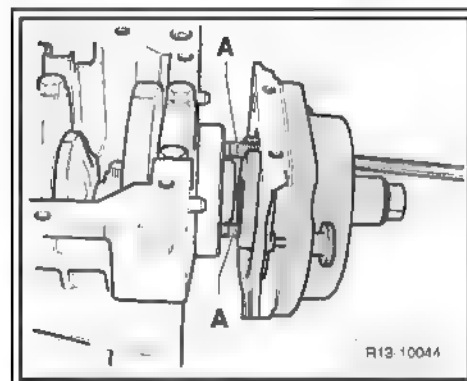


- Install Fitter with Allen screws -A- on the crankshaft flange.



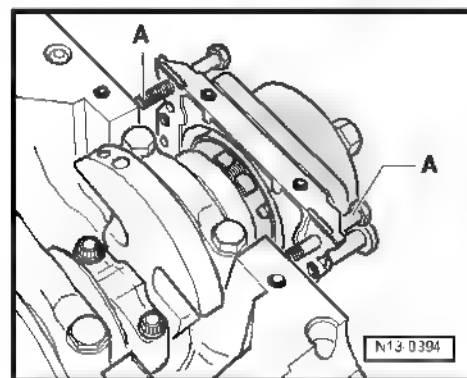
#### Note

Insert Allen screws -A- by approx. 5 thread fillets in the crankshaft flange.



- Install two screws M 6 × 35 mm -A- to guide the flange in the engine block.

#### C - Fitter in the crankshaft flange - tighten





- Move the assembly housing -A- manually towards the -arrow- until the sealing lip thrust ring -B- touches the crankshaft flange -C-.



#### Note

The guide pin -D- Fitter is inserted into a threaded hole on the crankshaft during assembly. Thus, the sensor rotor receives the definitive assembly position.

- Keep the assembly housing in this position and manually tighten both Allen screws on the assembly device.
- Screw the hex nut -E- manually to the threaded part until it lies on the assembly housing -A-.

D - Engine speed sensor - G28- rotor with the Fitter on the crankshaft flange - install

- Tighten the hexagonal nut of the Fitter using the Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331- and SW 24 Open socket - VAG 1332/11- . Tightening torque: 35 Nm.



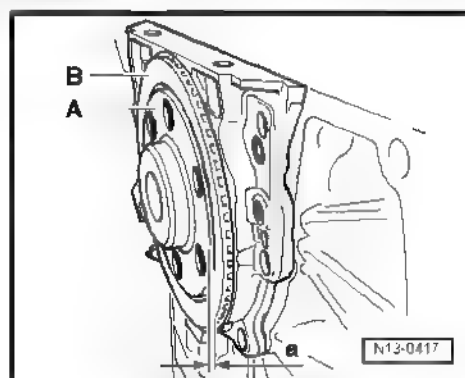
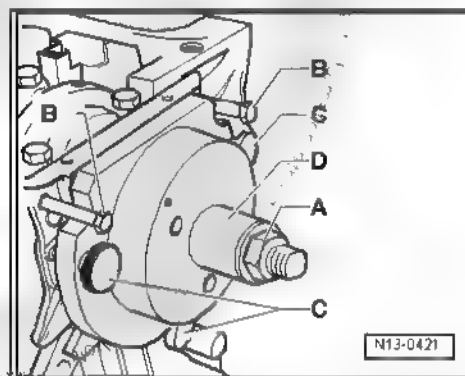
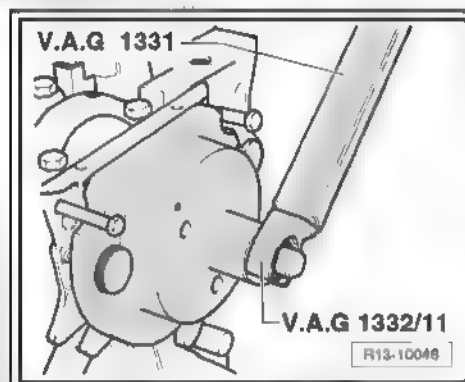
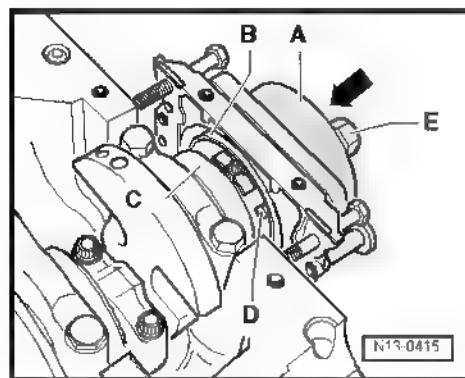
#### Note

After tightening the hex nut with 35 Nm of torque, there should still be a small clearance between the engine block and flange.

E - Installation position of the Engine speed sensor - G28- on the crankshaft - check

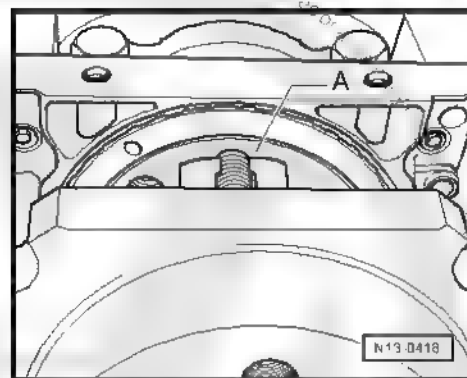
- Install the hex nut -A- to the end of the threaded part.
- Install both M 6 × 35 mm screws -B- to the cylinder block.
- Loosen the three splined screws -C- from the flange.
- Remove the fitter.
- Remove the sealing lip thrust ring.

The Engine speed sensor - G28- rotor is in the exact assembly position on the crankshaft when there is a distance -a- of 0.5 mm between the Engine speed sensor - G28- -B- rotor and the flange -A-.





- Place the Vernier calliper stem or a steel ruler against the crankshaft flange -A- (splined surface).



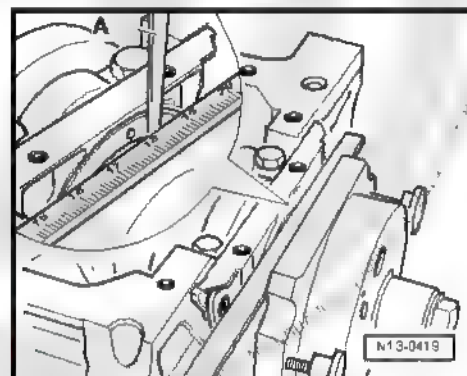
- By using a feeler gauge -A-, measure distance -a- between the Vernier calliper stem and the Engine speed sensor - G28- rotor.

If distance -a- is too small:

- Press the Engine speed sender - G28- [⇒ page 45](#) .

If the distance -a- is correct:

- Remove the fitter.
- Screw the flange fastening screws alternately in a **cross pattern**. Tightening torque: 10 Nm.



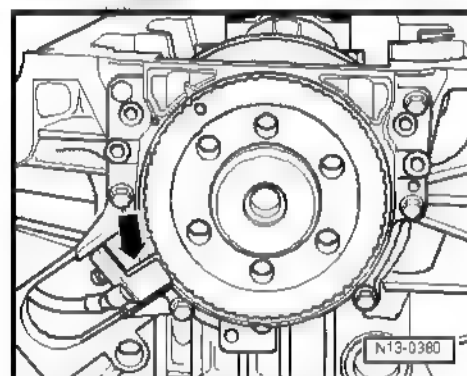
- Install the Engine speed sensor - G28- -arrow-. Tightening torque: 5 Nm.

- Install the oil pan [⇒ page 93](#) .

- Install intermediate plate.

- Install flywheel using new screws.

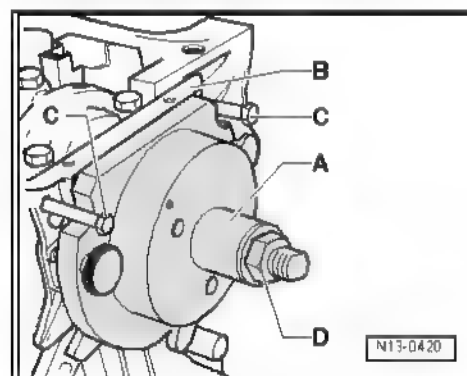
F- Engine speed sensor - G28- rotor - further compression



- Move the assembly housing -A- manually in the direction of the flange-B-.

- Install two screws M6×35 mm -A- to guide the flange-B- in the engine block.

- Install the hex nut -D- manually on the threaded part until it lies on the assembly case -A-.

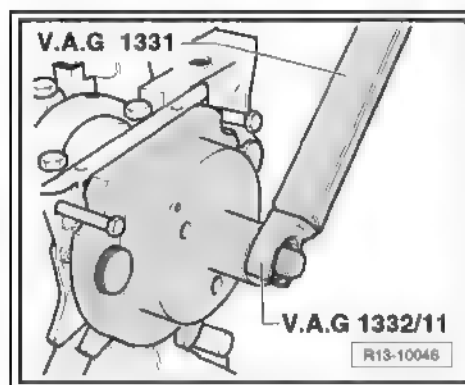




- Tighten the hexagonal nut of the Fitter using the Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331- and SW 24 Open socket - VAG 1332/11- . Tightening torque: 40 Nm.
- Check again the assembly position of the Engine speed sensor - G28- rotor on the crankshaft ➤ [page 44](#) .

If the distance -a- is again to small:

- Tighten the hex nut of the fitter with 45 Nm of torque once more.
- Check again the assembly position of the Engine speed sensor - G28- rotor on the crankshaft.





### 3 Crankshaft - remove and install



#### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque.*



#### Note

- ◆ To carry out assembly works, fasten the engine on the assembly stand, using the Support for VW 643 or VW 643/1 - VW 313- or Rotary stand for engine and gearbox - VAS 6095-.
- ◆ All contact and bearing surfaces must be lubricated with oil before assembly works.

#### 1 - Dragging element

- ☐ To activate the oil pump.
- ☐ Apply oil before installing the oil pump.

#### 2 - Bearing shells 1, 2, 3, 4 and 5

- ☐ Spare parts ordering classification  
⇒ [page 48](#).
- ☐ For bearing cover without lubrication groove.
- ☐ For block with lubrication groove.
- ☐ Do not mix the bearing shells that will be reused (mark).

#### 3 - 65 Nm

- ☐ Replace after each removal.

#### 4 - Bearing cap

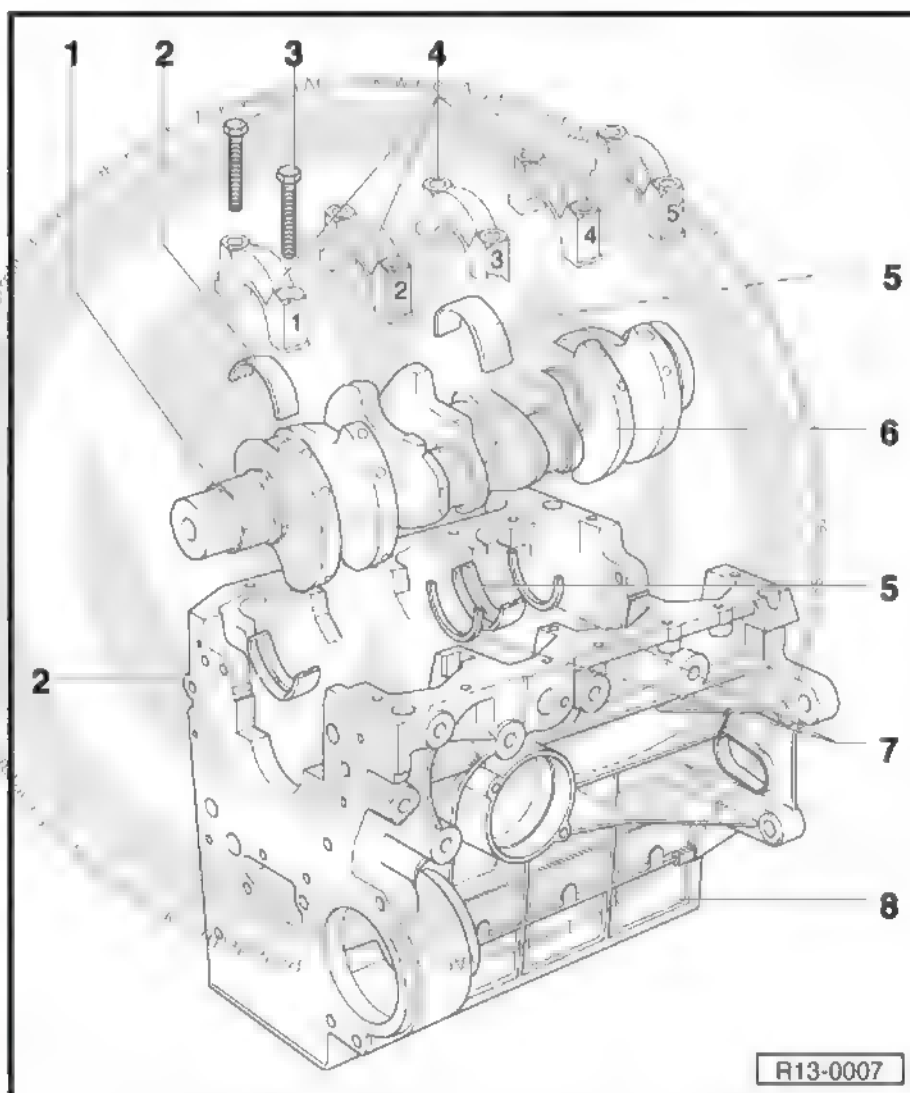
- ☐ Bearing cap 1: Pulley side.
- ☐ Bearing cap 3: With notches for adjustment rings.
- ☐ Block bearing cover / bearing cover retainers must oppose each other

#### 5 - Bearing shell 3

- ☐ ⇒ [Item 2 \(page 47\)](#)
- ☐ Do not mix the bearing shells that will be reused (mark).

#### 6 - Crankshaft

- ☐ New axial clearance 0.070...00.010 in wear limit: 0.263 mm.
- ☐ Measure radial clearance with new Plastigage: 0.016...0.036 mm wear limit: 0.070 mm.





- ☐ Do not turn the crankshaft while measuring radial clearance.
- ☐ Crankshaft dimensions ➔ [page 48](#)

#### 7 - Fitted ring

- ☐ For bearing block 3.

#### 8 - Engine block

- ☐ Check cylinder diameter ➔ [page 53](#)
- ☐ Piston and cylinder dimensions ➔ [page 54](#).

### 3.1 Identifying engine bearing shells

- Crankshaft bearing shells are classified at the plant and marked on the engine block and crankshaft as indicated. To identify the bearing shells, the oil crankcase must be removed so that the code can be read.

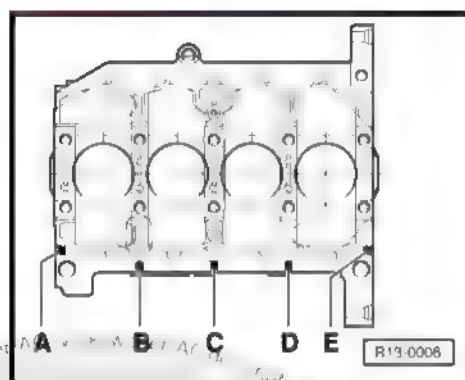
#### 3.1.1 Crankshaft upper bearing shell code



##### Note

- ♦ The engravings may also be grouped around the letter D of the above illustration.
- ♦ Use the yellow bearing shells (colour code G) when there is no identification.

A	=	Code for bearing 1
B	=	Code for bearing 2
C	=	Code for bearing 3
D	=	Code for bearing 4
E	=	Code for bearing 5



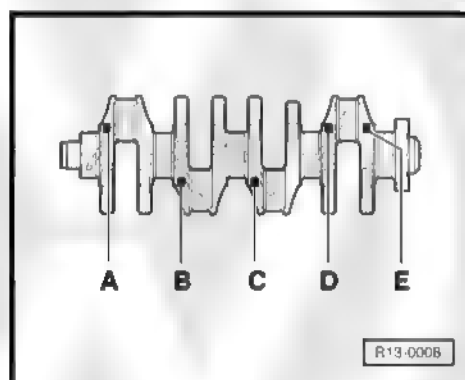
#### 3.1.2 Crankshaft bottom bearing shell code (bearing cap)



##### Note

It may be also engraved on the supporting face of the flywheel.

A	=	Code for bearing 1
B	=	Code for bearing 2
C	=	Code for bearing 3
D	=	Code for bearing 4
E	=	Code for bearing 5



#### 3.1.3 Colour codes

R	=	red
G	=	yellow
B	=	blue

### 3.2 Crankshaft - dimensions

(dimensions in mm)



Grinding measurements	Crankshaft bearing Trunnion-Ø	Connecting rod bearing Crankpin-Ø
Basic measurement	53 968...53 983	41.965 41 980
First grinding (0.25)	53 718...53 733	41.715...41.730
Second grinding (0.50)	53 468...53 483	41.465...41.480
Third grinding (0.75)	53.218...53.233	41.215...41.230







## 4 Pistons and connecting rods - removal and installation



### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque.*



### Note

*All contact and bearing surfaces must be lubricated with oil before assembly works.*

#### 1 - Piston

- ☐ Check ➤ [page 52](#)
- ☐ Mark assembly position and correspondence with the cylinder.
- ☐ Arrow on piston head points to the pulley side.
- ☐ Assemble with the piston ring tensioning strap.

#### 2 - Piston pin

- ☐ In case of difficulties during removal, heat piston to 60°C.
- ☐ Remove and install with Pin or VW 010-206 - 10-206-.

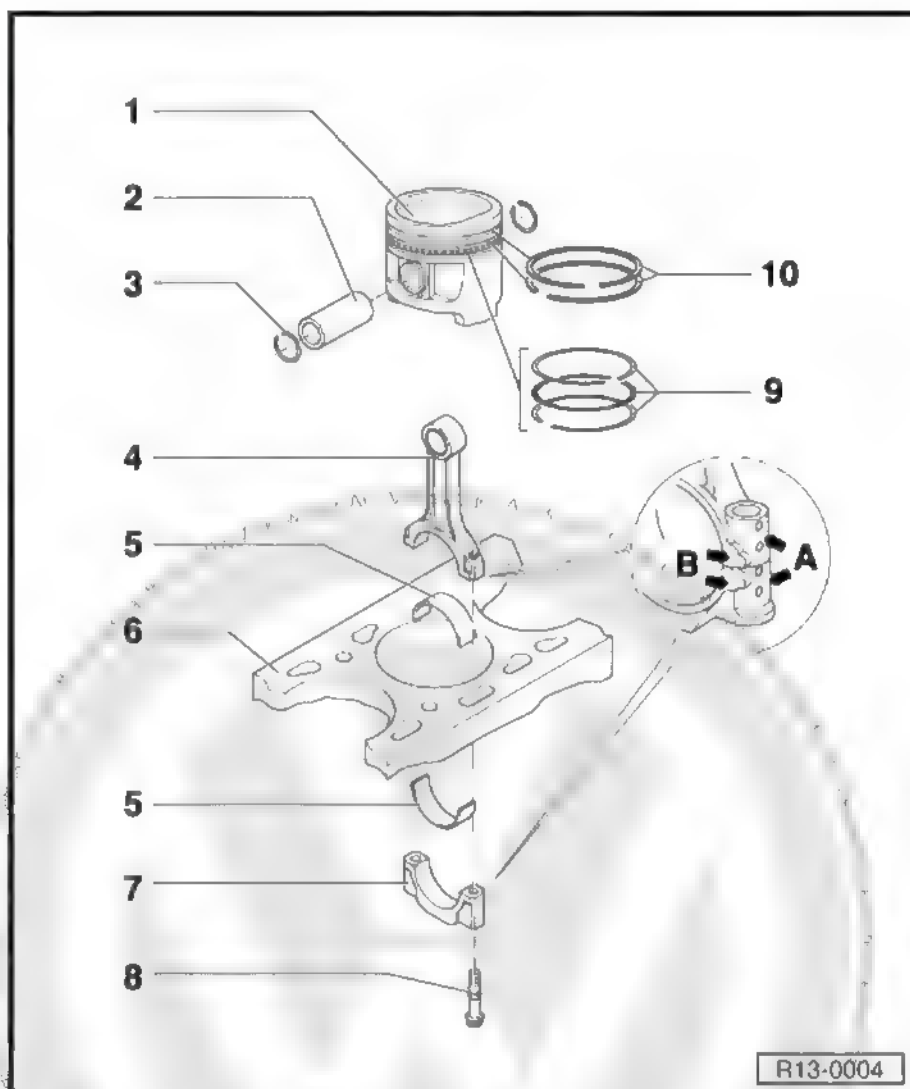
#### 3 - Piston pin retaining ring

- ☐ Replace.

#### 4 - Connecting rod

- ☐ Replace complete set only (4 units).
- ☐ Mark corresponding position relative to cylinder -A-.
- ☐ Assembly position: marks -B- point to the flywheel side.
- ☐ On connecting rods without marks -B-, the installation position is the painted faces (connecting rod and cap), facing the crankcase venting device side.

- ☐ Besides defining the pair (connecting rod and cap), colours painted on connecting rods and caps also define the position (connecting rod in cap).
- ☐ Piston/connecting rod axial clearance; 0.20...0.40 mm wear limit 0.50 mm.
- ☐ It is separated from cap by the breakage process ➤ [page 51](#)







#### 5 - Bearing shell

- ☐ Check assembly position
- ☐ Do not mix bearing shells.
- ☐ Install bearing shells centrally ➤ [page 53](#)
- ☐ Measure radial clearance with new Plastigage: 0.010, 0.057 mm wear limit: 0.091 mm Do not rotate crankshaft while measuring radial clearance

#### 6 - Engine block

- ☐ Check cylinder diameter ➤ [page 53](#)
- ☐ Piston and cylinder dimensions ➤ [page 54](#).

#### 7 - Connecting rod cap

- ☐ Check assembly position.
- ☐ Due to the rupture process applied to the conrods, the cap can be assembled in only one position and only on the respective conrod ➤ [page 51](#)
- ☐ Install centred bearing shells.
- ☐ Besides defining the pair (cap and connecting rod), colours painted on caps and connecting rods also define the position (cap in connecting rod).
- ☐ Measure radial clearance with new Plastigage: 0.020...0.061 mm - wear limit: 0.091 mm. Do not rotate crankshaft while measuring radial clearance.

#### 8 - 20 Nm + 90°

- ☐ Replace after each removal.
- ☐ Lubricate threads and stop surfaces.
- ☐ Tighten to 20 Nm to measure radial clearance, but do not apply the angular torque.

#### 9 - Oil scraper rings

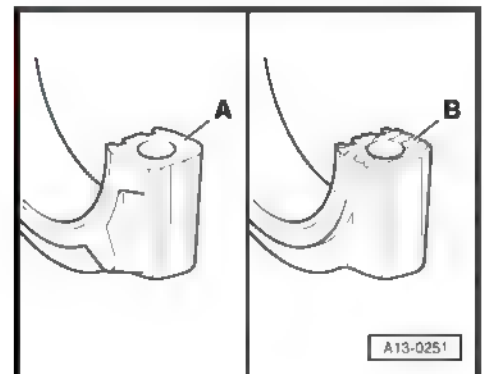
- ☐ Remove and install manually and carefully the 3-part oil scraper rings.
- ☐ "TOP" mark must point towards piston head.
- ☐ Check opening between ends ➤ [page 52](#)
- ☐ Check clearance on the piston channel ➤ [page 52](#)

#### 10 - Compression rings

- ☐ Position the apertures in 120°.
- ☐ Remove and install compression rings with compression ring pliers.
- ☐ "TOP" mark points towards the piston head.
- ☐ Check opening between ends ➤ [page 52](#)
- ☐ Check ring clearance in the piston groove ➤ [page 52](#)

#### Connecting rods - features

- A- Conventional connecting rods (smooth separation surface).
- B- Broken connecting rods (rough separation surface).





### Openings of piston ring ends - check

- Insert the ring at right angle from top to the cylinder lower opening, with a distance of approx. 15 mm to cylinder edge.

#### AQZ, BJE and BNX engines

Piston ring	Wear limit
1. Compression ring	1.0 mm
2. Compression ring	1.0 mm
Oil scraper ring	1.0 mm

#### CCNA/CBPA engines

Ring		Opening gap	
		new	wear limit
1st compression ring	mm	0.15...0.30	1.0
2nd compression ring	mm	0.20...0.40	1.0
Oil scraper ring	mm	0.25...0.75	1.0

### Check ring clearance in the piston groove

Clean ring groove before test.

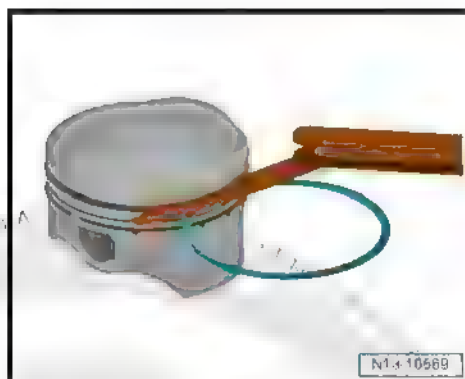
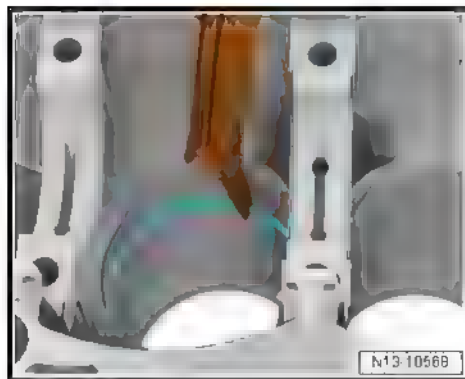
#### AQZ, BJE and BNX engines

Piston ring	Wear limit
1. Compression ring	0.150 mm
2. Compression ring	0.150 mm
Oil scraper ring	0.186 mm

#### CCNA/CBPA engine

Ring		Groove clearance		
		new (with Mahle piston)	new (with Federal Mogul piston)	wear limit
1st compression ring	mm	0.030...0.080	0.030...0.080	0.15
2nd compression ring	mm	0.030...0.070	0.030...0.070	0.15
Oil scraper ring	mm	0.000...0.090	0.000...0.090	0.20

### Pistons - check



Special tools and workshop equipment required

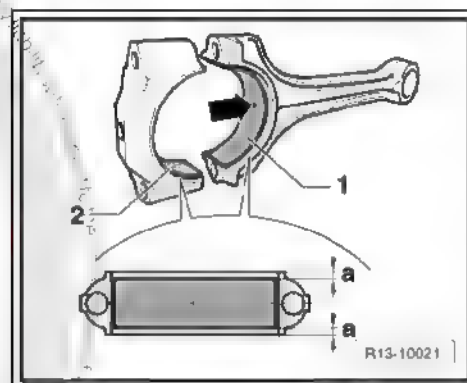


◆ External micrometer 60...90 mm

- Measure to approx. 10 mm from lower corner, displaced by 90° in relation to the piston pin axis. Divergence in max. nominal measure 0.04 mm. Nominal measure ➔ [page 54](#) .

Connecting rod bearing shells - installation

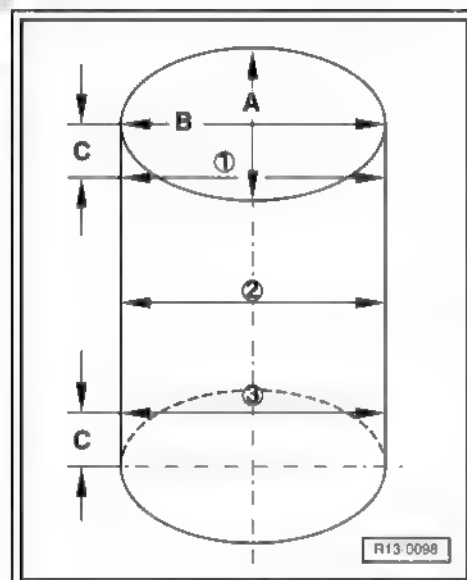
- -1- Bearing shell with bore for piston pin lubrication groove -arrow-
- -1 and 2- Bearing shell positions on connecting rod and connecting rod cap -a- right and left sides equal.
- -a- Maximum tolerance = 0.2 mm.



Note

*Both for connecting rod and connecting rod cap, bearing shells provide bores to prevent erroneous installation.*

Check cylinder compression



Special tools and workshop equipment required

- ◆ Precision internal micrometer 50...100 mm
- Measure at three different points, in transversal cross pattern, -A- and in longitudinal direction -B-, with a distance of 10.0 mm from the upper and lower edges -C-. Maximum nominal tolerance value. 0.08 mm. Nominal measure ➔ [page 54](#) .



Note

*The cylinder diameter should not be measured while the engine block is secured to the assembly stand with the Support - VW 540- , because this can produce erroneous measurements.*



## 4.1 Pistons and cylinders - dimensions

AQZ, BJE, BNX and CCNA engines

Grinding specifications		Piston-Ø <sup>5)</sup>	Piston-Ø <sup>5)</sup>	Piston-Ø <sup>5)</sup>	Internal cylinder Ø
Manufacturer		Mahle	Federal Mogul	KS Pistols	
Basic specification	mm	67.076 a 67.094	67.078 to 67.092	67.076 a 67.094	67.105 a 67.115
Grinding I	mm	67.326 to 67.344	67.328 to 67.342	67.326 to 67.344	67.355 to 67.365
Grinding II	mm	67.576 to 67.594	67.578 to 67.592	67.576 to 67.594	67.605 to 67.615
Grinding III	mm	67.826 to 67.844	67.828 to 67.842	67.826 to 67.844	67.855 to 67.865

CPBA Engine

Grinding specifications		Piston-Ø <sup>5)</sup>	Piston-Ø <sup>5)</sup>	Internal cylinder Ø
Manufacturer		Mahle	Federal Mogul	
Basic specification	mm	67.076 a 67.094	67.078 to 67.092	67.105 a 67.115
Grinding I	mm	67.326 to 67.344	67.328 to 67.342	67.355 to 67.365
Grinding II	mm	67.576 to 67.594	67.578 to 67.592	67.605 to 67.615
Grinding III	mm	67.826 to 67.844	67.828 to 67.842	67.855 to 67.865

5) The specifications recommendations apply to non-lubricated pistons. Lubricated pistons may have a 0.030 bigger Ø at the measuring point, according to the kilometres travelled.



## 15 – Cylinder head, valve gear

### 1 Cylinder head - assembly and disassembly

Check compression → [page 70](#) .



#### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque.*



#### Note

- ◆ *When a replacement cylinder head is assembled, it is necessary to lubricate all contact surfaces between support elements and valve seats, before assembling the cylinder head.*
- ◆ *The plastic shims provided for protecting the open valves should not be removed until immediately before fitting the cylinder head.*
- ◆ *When replacing the cylinder head, all coolant must also be replaced.*
- ◆ *With the cylinder head removed, use the Plate - VW 5541/3- to fasten the cylinder head and valve support.*





1 - 20 Nm + 90°

- ☐ Replace after each removal.
- ☐ To loosen and tighten, immobilize the camshaft gear with the Special wrench - 3036-.

2 - Camshaft gear

- ☐ Observe fastening during assembly.
- ☐ Check the installation position of toothed belt => [page 59](#) .

3 - 10 Nm

- ☐ Apply Liquid sealant - D 000 600 A2- .

4 - Rear cover of the mechanical distribution

5 - Cylinder head cover

- ☐ Sealing surfaces cannot be ground.
- ☐ Cover and head form a pair; therefore, the pair engraving is on the exhaust manifold side, close to Hall Sensor - G40- .
- ☐ With integrated camshaft bearings.
- ☐ Remove any residue of Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- .

- ☐ Apply Sealant compound for engines - AMV 188 001 02- or Sealant compound for engines - D 154 103 A1- before positioning.
- ☐ For assembly, place in vertical position from top with the pins in the cylinder head holes.
- ☐ Remove and install => [page 82](#) .

6 - Engine cylinder head screw

- ☐ Replace after each removal.
- ☐ Observe assembly and sequence instructions when loosening and tightening > [page 64](#) .

7 - Oil deflector

- ☐ Check assembly position.

8 - Oil reservoir lid

- ☐ Replace the gasket if damaged.

9 - Trim

- ☐ Replace if damaged

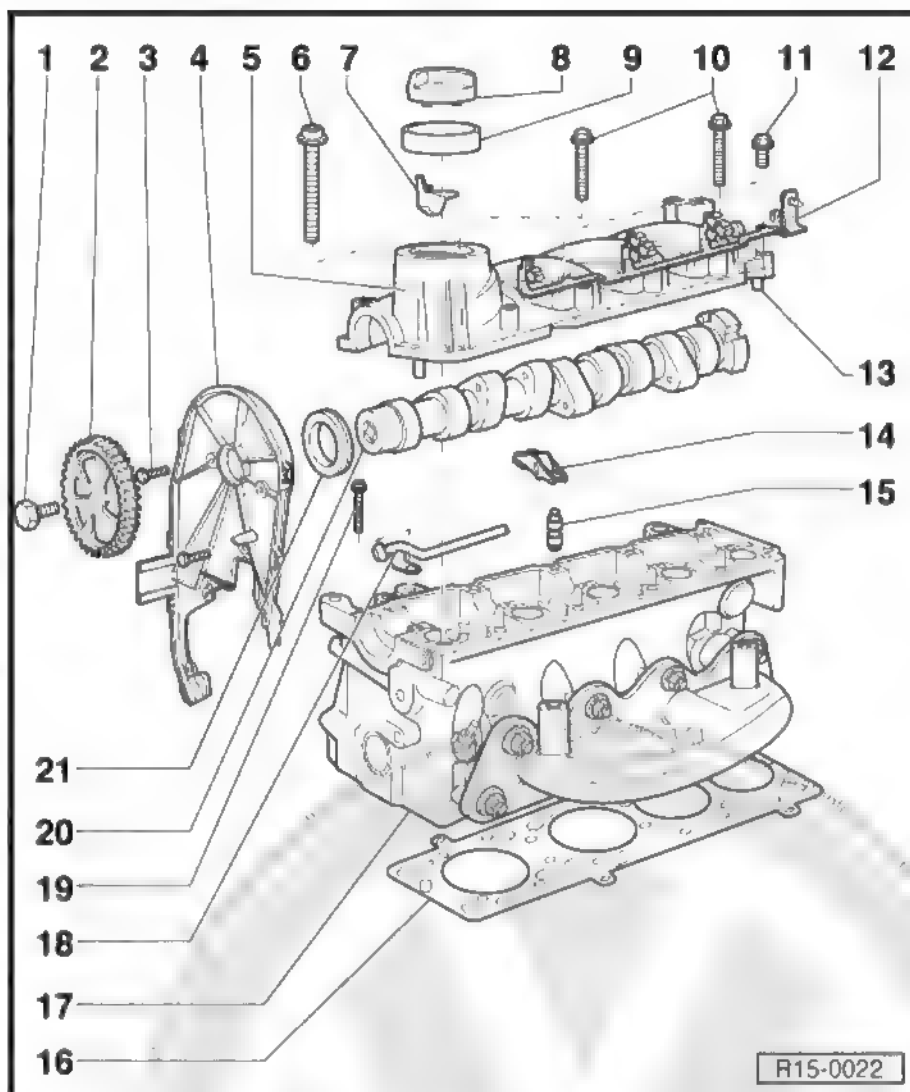
10 - 6 Nm + 90°

- ☐ Replace after each removal.
- ☐ Observe installation and sequence instructions when loosening and tightening > [page 82](#) .

11 - 10 Nm

12 - Support

- ☐ For ignition cables.







### 13 - Guide pin

### 14 - Roller rockers

- ☐ Check the roller bearing.
- ☐ Lubricate the surface of the roller bearing with oil.
- ☐ For installation, fit the safety clip to the support element.
- ☐ Supplier "INA" with "030" engraving on the side near the spherical region.
- ☐ Supplier "GTT" with "S3011" engraving on the side near the spherical region.
- ☐ Do not mix, as in a single head only parts from the same supplier may be installed.

### 15 - Support element

- ☐ Do not change positions.
- ☐ With valve clearance hydraulic offsetting.
- ☐ Lubricate the surface of the roller bearing with oil.
- ☐ Supplier "INA" with "I" engraving on the bottom of the support element.
- ☐ Supplier "GTT" with "GT" engraving on the bottom of the support element.
- ☐ Do not mix, as in a single head only parts from the same supplier may be installed.

### 16 - Cylinder head sealing gasket

- ☐ Metal gasket.
- ☐ Replace.
- ☐ After replacing, replace all coolant.

### 17 - Engine cylinder head

- ☐ The sealing surface on the camshaft side must not be ground.
- ☐ The head and the cover form a pair; therefore, the engraving for the pair is on the exhaust tube side, close to Hall Sensor - G40- .
- ☐ Check warping ⇒ [page 58](#)
- ☐ After replacing, replace all coolant.
- ☐ Camshaft - repair ⇒ [page 74](#).

### 18 - Lines

### 19 - 20 Nm

### 20 - Camshaft

- ☐ Camshaft repair ⇒ [page 74](#) .
- ☐ Removal and installation ⇒ [page 82](#) .

### 21 - Camshaft seal

#### Seal with spring

- ☐ Quickly lubricate with oil the sealing ring lip.

#### Seal without spring

- ☐ The sealing ring lip does not require lubrication.
- ☐ Replace ⇒ [page 79](#) .
- ☐ Install only the seal without spring for the CPBA engine.

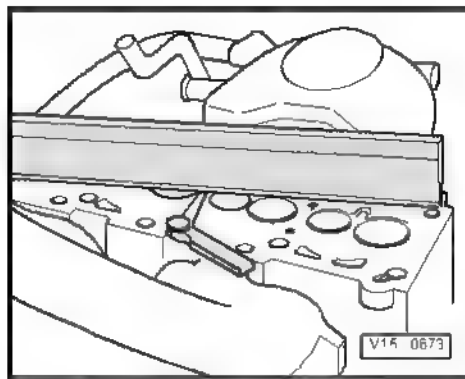


## Cylinder head warping - check



### Note

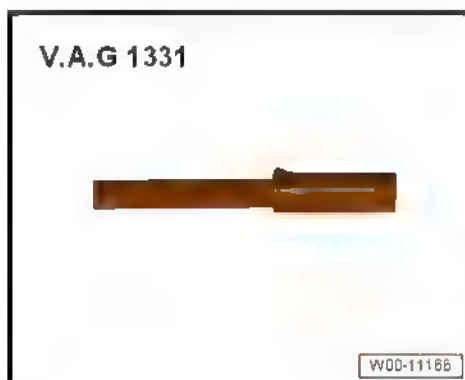
Maximum warping allowed: 0.05 mm



## 1.1 Toothed belt semi-automatic tensioning pulley - check

Special tools and workshop equipment required

- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-



### Test sequence

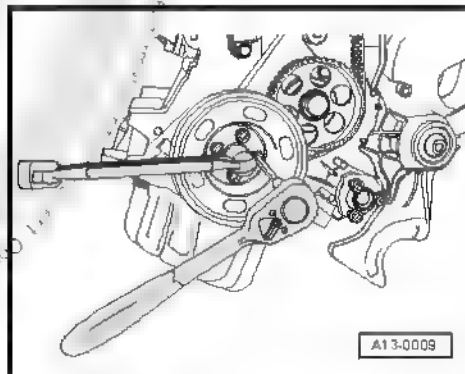
- Remove air filter body ⇒ [page 170](#) .
- Remove lower noise insulation from engine compartment.
- Remove the front right wheel case protector: ⇒ General body repairs, exterior; Rep. gr. 66 ; External equipment .
- Mark the operating direction of the Poly-V belt, and remove it ⇒ [page 24](#) .
- Remove exhaust manifold protective plate.

### Vehicles with air conditioning

- Remove the tensioning pulley from the Poly-V belt

### Continued for all vehicles

- Remove crankshaft pulley.
- Remove mechanical distribution lower and upper covers.
- Turn crankshaft twice towards the direction of engine rotation until it is in the cylinder 1 TDC.







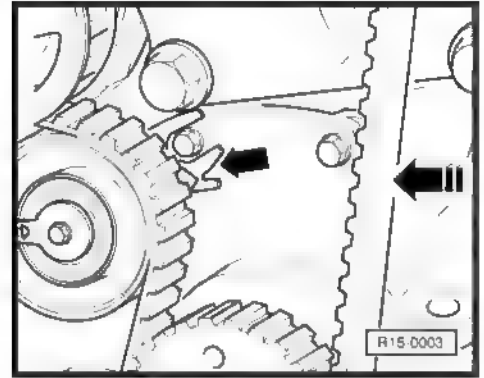
- Memorize the position of the tensioning roller indicator -arrow- Press thumb down with force on the drive belt. The indicator arm should move.
- Loosen the drive belt once again.
- Turn the crankshaft twice in the direction that the engine turns.
- Check the position of the indicator arm. It must return to the original position

If the indicator does not return to its original position:

- Replace the belt tensioning roller.

If the belt tensioning roller is in order:

- Install the lower and upper covers of the mechanical distribution.
- Install the crankshaft pulley (check the fastening). Tightening torque: 15 Nm + 40°.



Vehicles with air conditioning

- Install Poly-V belt tensioning element. Tightening torque:
  - ◆ M8 = 23 Nm
  - ◆ M10 = 45 Nm

Continued for all vehicles

- Install exhaust manifold deflector plate. Tightening torque: 10 Nm.
- Install Poly-V belt ⇒ [page 24](#) .



#### Note

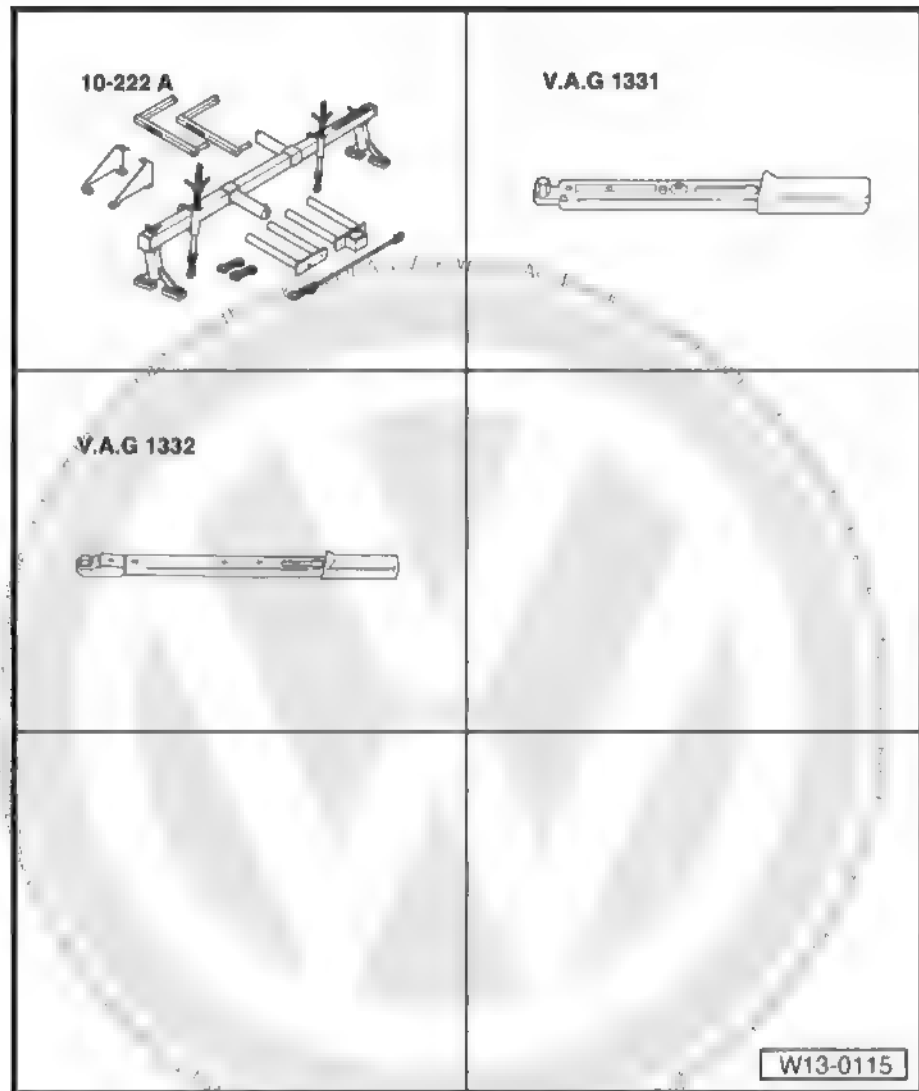
*While installing the Poly-V belt, carefully observe the proper seating of the belt on the pulley.*

- Install the front right wheel case protector: ⇒ General body repairs, exterior; Rep. gr. 66 ; External equipment .
- Install engine compartment lower noise insulation.
- Install air filter housing ⇒ [page 170](#) .

## 1.2 Toothed belt - remove and install, adjust



Special tools and workshop  
equipment required



- ◆ Support device - 10-222A- with Clamps - 10-222 A/1-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-
- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-

No illustration:

- ◆ Lifting eyelets # of replacement part: - 030 0103 390 F- (pulley side) - 030 0103 390 G- (inertia flywheel side).
  - ◆ -Hexagon key-
- (Adjust command times)

### 1.2.1 Removal

- Remove air filter body ➔ [page 170](#) .
- Remove right front wheel case cover: ➔ General outer body assembly jobs; Rep gr. 66 ; External equipment .
- Mark the position of the turning direction of the Poly-V belt and remove it ➔ [page 24](#) .
- Remove the heat deflector from the exhaust manifold.

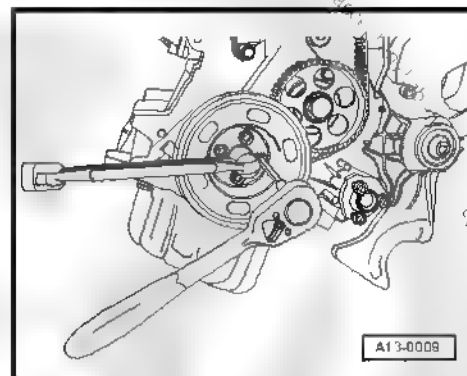
Vehicles with air conditioning

- Remove the tensioning pulley from the Poly-V belt

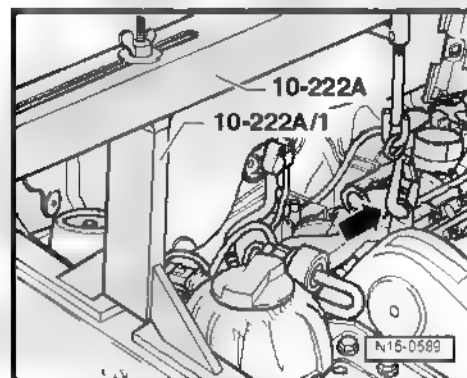


Continued for all vehicles

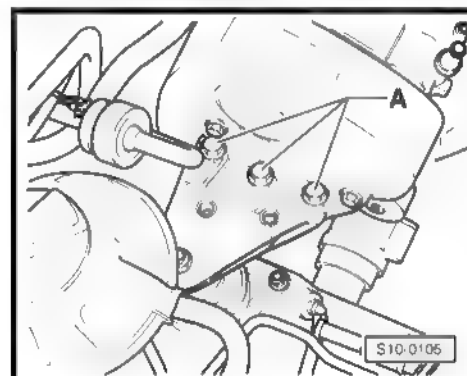
- Remove the mechanical distribution top cover.
- Remove crankshaft pulley.
- Remove lower cover to mechanical distributor.
- Disconnect cooling system lines from the engine cylinder head.
- Screw lifting eyelets in the place of the cylinder head cooling system pipes. Tightening torque: 25 Nm



- Place the Support - VW 061 (VWB) - ou - 10-222A- the Claws - 10-222 A/1- or the Adapter - T02007- as illustrated and hold the engine in installation position.
- Remove coolant reservoir (hoses remain connected).
- Secure the engine a little and loosen fastening screws -A-.

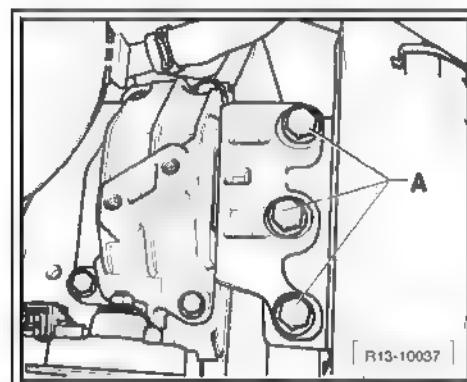


Until December 9, 2007



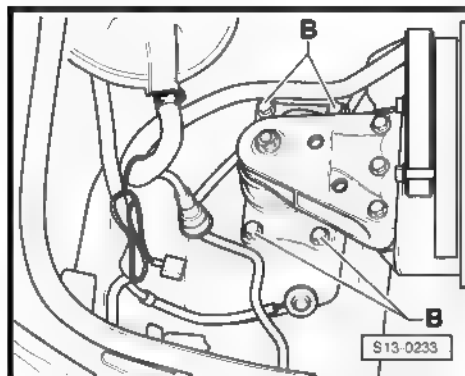
From December 10, 2007

- Loosen fastening screws -B- and also the complete subframe.



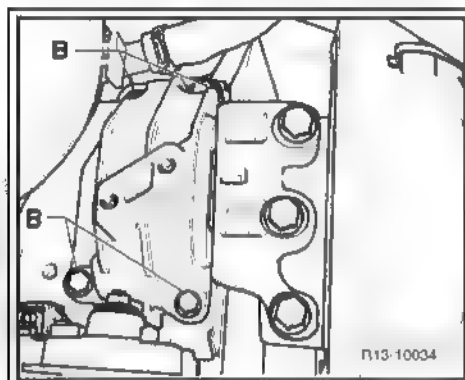


Until December 9, 2007



From December 10, 2007

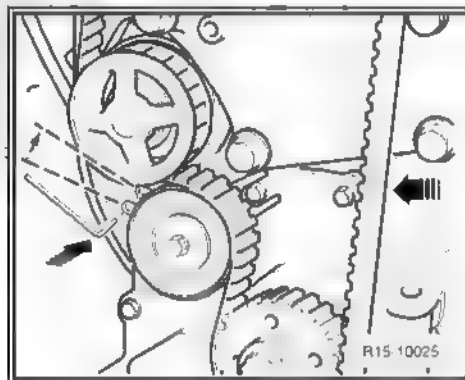
- Remove engine support in the engine block.
- Mark the operation direction of the toothed belt.
- Loosen the belt tensioning roller and remove the toothed belt.



## 1.2.2 Tensioning element without adjustment

Press the toothed belt in the direction of the -arrow-, on the right side.

- With the bearings aligned, install the lock pin (Allen 2.5 mm).
- Remove the tensioning element.
- Remove the toothed belt and mark the direction of rotation.



## 1.2.3 Installation

### Conditions

- The engine must be warm, at most
- The pistons cannot be in the TDC.



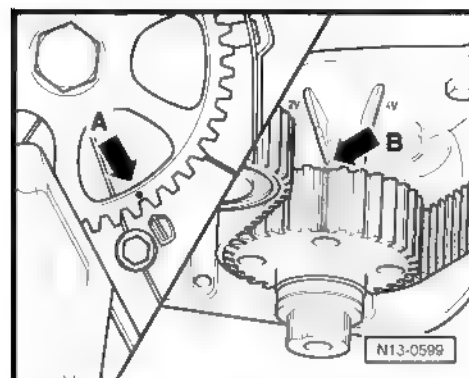
### Note

*When turning the camshaft, the valves may hit the pistons located in the TDC.*

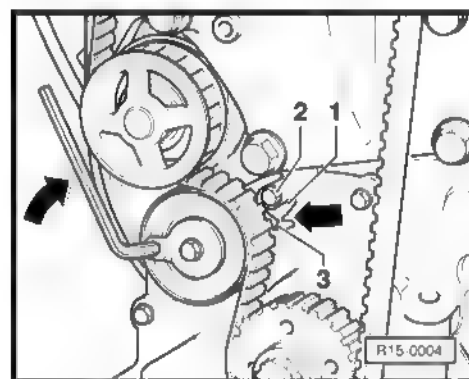


### Operation sequence

- Place the camshaft gear onto the mark -arrow A-.
- Place the crankshaft in the cylinder 1 TDC. The chamfered tooth on the crankshaft sprocket must match the "2 V" mark on the flange/oil pump -arrow B-.
- Install the toothed belt. Check operating direction on used toothed belts.

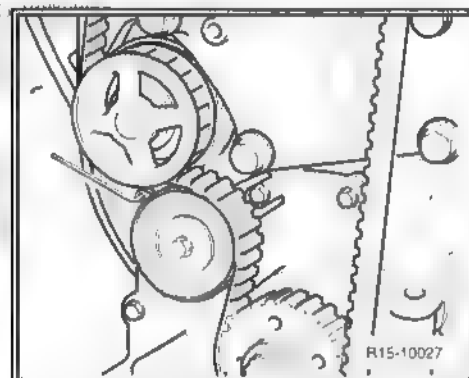


- Manually tighten the securing bolt of the belt tensioner roller. The base plate notch -1- must reach over the fastening screw -2-.
- Stretch the toothed belt by turning the belt tensioning roller towards -arrow- until the indicator -3- reaches the mark on the base plate -arrow-.
- Tighten the screw fastening the tensioning roller. Tightening torque: 23 Nm.
- Turn crankshaft twice in the direction of engine rotation until it is again in cylinder 1 TDC.
- Then, check again the adjustment of the toothed belt and the position of the belt tensioning roller.

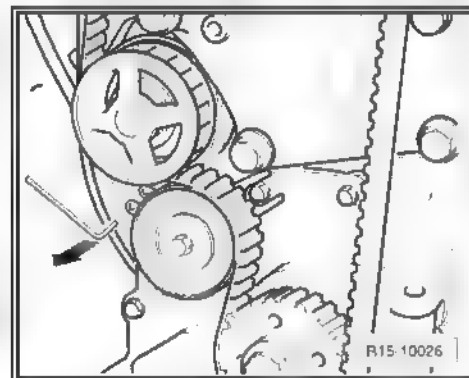


### 1.2.4 Tensioning element without adjustment

- Install the toothed belt on the camshaft and the water pump gear.
- Install the tensioning element with the lock pin (Allen 2.5 mm) installed.
- Apply 23 Nm of torque to the fastening screw.
- Install the belt on the crankshaft gear.



- Remove the lock pin (Allen 2.5 mm) from the tensioning element.
- Turn the crankshaft twice in the direction of engine rotation until reaching top dead centre for cylinder 1.
- Then, check gear positions again.





- If necessary, repeat adjustment of the toothed belt.
- Install engine right support on the engine block. Tightening torque: 50 Nm.
- Install the lower cover of the mechanical distribution.
- Install the crankshaft pulley (check the fastening). Tightening torque: 15 Nm + 40°.

#### Vehicles with air conditioning

- Install Poly-V belt tensioning pulley Tightening torque:
  - ◆ M 8: = 23 Nm
  - ◆ M 10 = 45 Nm

#### Continued for all vehicles

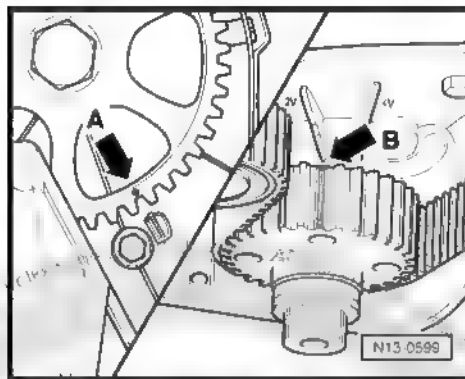
- Install exhaust manifold heat baffle. Tightening torque: 10 Nm.
- Install the powertrain supports. Tightening torque ⇒ [page 15](#) ⇒ [page 15](#) .
- Install the upper cover of the mechanical distribution.
- Install Poly-V belt ⇒ [page 24](#) .



#### Note

*While installing the Poly-V belt, carefully check the proper seating of the belt on the pulley.*

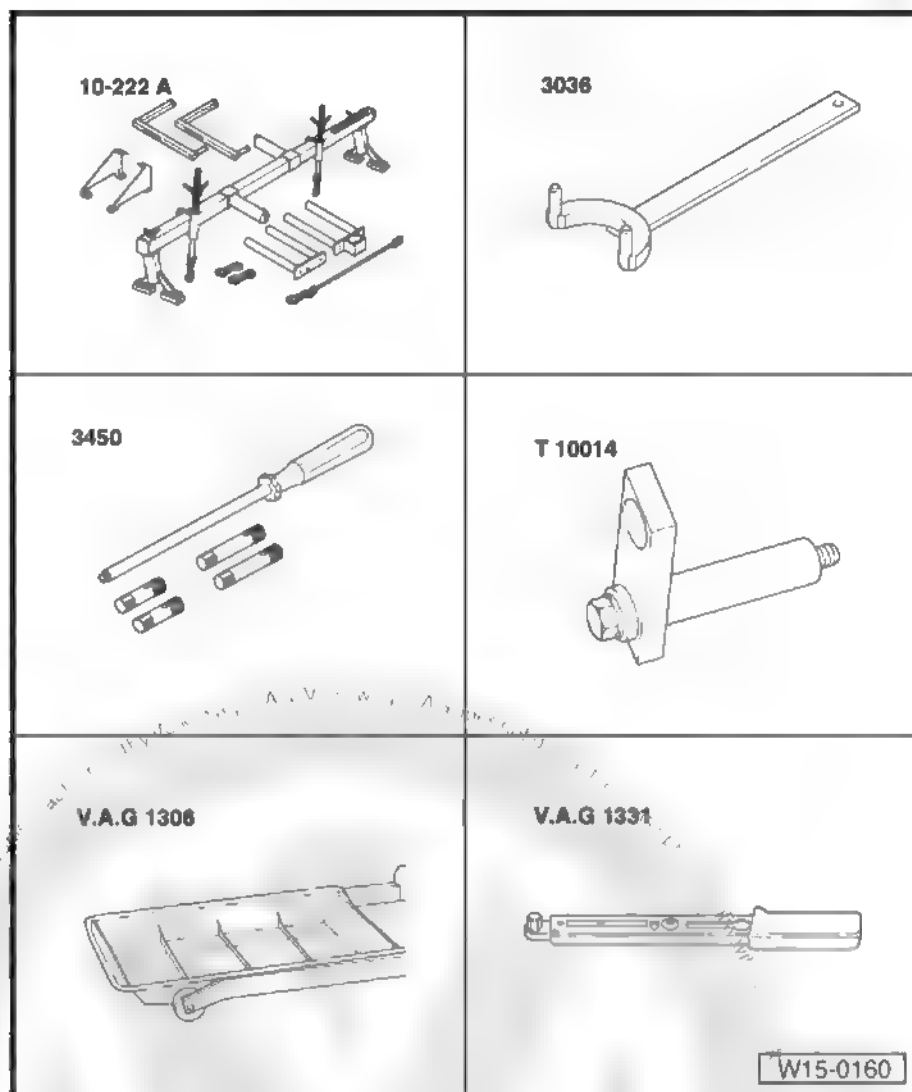
- Install the front right wheel case protector: ⇒ General body repairs, exterior; Rep. gr. 66 ; External equipment .
- Install engine compartment lower noise insulation.
- Install coolant reservoir.
- Remove lifting eyelet from engine cylinder head.
- Install cooling system pipes on engine cylinder head. Tightening torque: 25 Nm.
- Install air filter housing ⇒ [page 169](#) .



### 1.3 Cylinder head - remove and install



**Special tools and workshop equipment required**



- ◆ Supporting device 10-222A- with the Clamps - 10-222 A/1- or the Adaptor - T02007-
- ◆ Pin wrench - 3036-
- ◆ Guides - 3450-
- ◆ Support - T10014- or Lock - T10109-
- ◆ M11/M12 (enc.1/2") multi-toothed socket wrench - VW 001N- or Special long wrench - T10070-
- ◆ Oil trap - VAG 1306-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-

No illustration:



#### V.A.G 1332



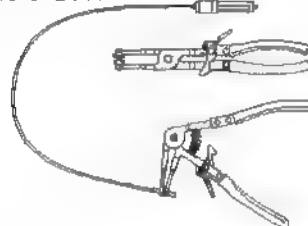
W00-11185

- ◆ Lifting eyelets # of replacement part: -030 0103 390 F- (pulley side) - 030 0103 390 G- (inertia flywheel side).
- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-
- ◆ Standard-type clamp pliers - VW 5162 (VWB) - ou - VAS 5024A-

#### Initial conditions

- Engine warm, at most.

#### VAS 5024 A



W00-1179

### 1.3.1 Removal



#### Note

- ◆ *In order to perform these tasks, it is necessary to disconnect the Battery - A- earth wire. To do so, check if the vehicle has a coded radio. If so, request the respective anti-theft code.*
- ◆ *The camshaft bearings are integrated with the engine cylinder head and its cover. Before removing the cylinder head cover, loosen the toothed belt.*
- With the ignition turned off, disconnect the earth wire from the battery - A- .
- Remove air filter ⇒ [page 170](#) .
- Disconnect cooling system lines from the engine cylinder head.
- Screw lifting eyelets in the place of the cylinder head cooling system pipes. Tightening torque: 25 Nm.
- Loosen right front wheel case cover ⇒ General body repairs, external; Rep. gr. 66 ; External equipment.
- Remove toothed belt ⇒ [page 59](#) .
- Remove camshaft gear to loosen the bolt and immobilize the camshaft gear with the Pin wrench - 3036- .
- Loosen three fastening screws of the back cap.





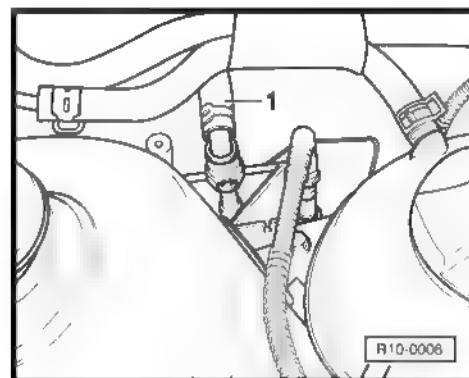
#### WARNING

*Fuel supply hose is under pressure. Wrap hose connections in cloth prior to loosening. Next, eliminate pressure by carefully removing hose.*

For AQZ engine

- Disconnect the fuel supply pipes 1 (press the unlock key).

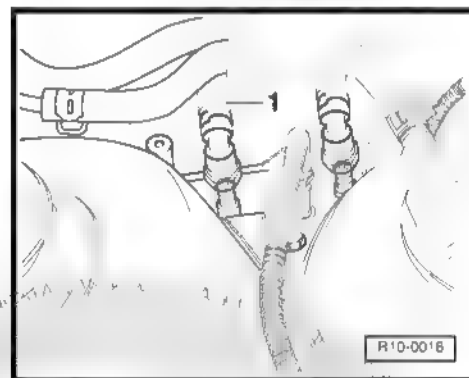
For BJE, BNX, CCNA, CPBA engines



- Disconnect the fuel supply pipes 1 (press the unlock key).

Continuation:

- Loosen the hose for the Magnetic valve 1 for activated charcoal reservoir - N80- 1 on the intake manifold.
- Close the pipes so as to avoid any dirt from coming into the supply system.
- Disconnect or loosen the following components:
  - ◆ intake manifold vacuum hose for the brake servo.
  - ◆ the fitting connector for the Ignition transformer - N152- and the Throttle valve control unit - J338- .
  - ◆ disconnect connectors from the Ignition coils with final power stage (CPBA engine).
  - ◆ injection valve connectors.
  - ◆ the Engine speed sensor - G28- and Intake manifold pressure sensor - G71- / Air intake temperature sensor - G42- connectors.
  - ◆ 2-pole fitting connector for the Knock sensor 1 - G61- (intake manifold side).
  - ◆ the connector for the Coolant temperature sensor - G62- and Oil pressure switch - F1- .





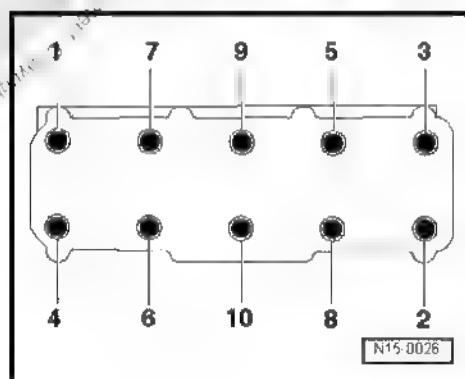
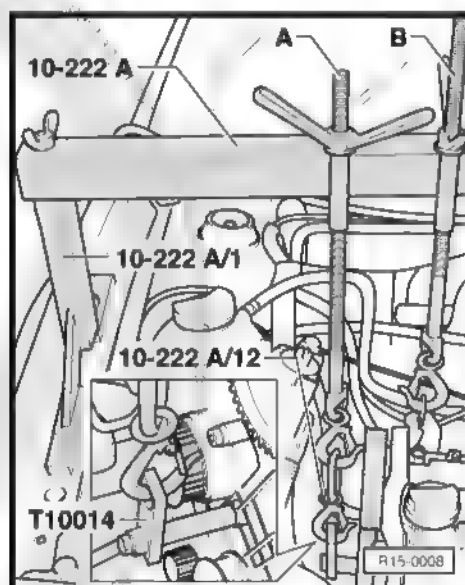
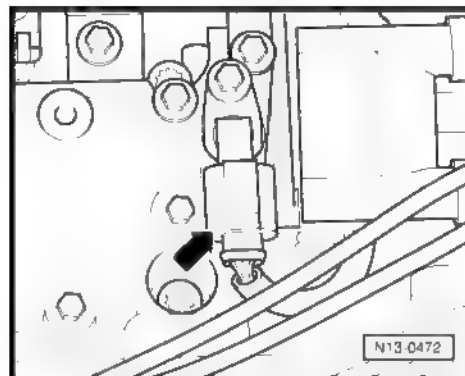
- Disconnect the 3-pole connector of the Sensor Hall - G40-arrow-
- Remove the fuel rail with all its injectors in its entirety  
→ [page 168](#) .
- Open and close the coolant tank cap to depressurize the cooling system once more
- Drain cooling system → [page 110](#) .
- Remove the clip on the cooling system thermostat valve body, which holds the cooling system tube on the pump.
- Remove the thermostat valve body from the engine cylinder head.
- Disconnect all connection hoses, cooling system, vacuum and suction hoses from the engine cylinder head.
- Disconnect exhaust tube from the exhaust manifold.
- Loosen the oil dipstick guide tube from intake manifold.
- Then, raise the engine a little bit with the threaded part -B- .



#### Note

*Since the lifting eyelet is screwed to the engine cylinder head, an additional support must be secured to the engine block to support the engine.*

- Screw, as indicated, the Support - T10014- or the Lock - T10109- into the threaded hole in the water pump area on the cylinder block. Tightening torque: 20 Nm.
- Slightly raise the engine with the second threaded part -A- until the threaded part -B- is relieved.
- Remove threaded part -B-.
- Loosen the engine cylinder head screws in the indicated sequence and remove them.
- Raise the engine cylinder head carefully.





## 1.3.2 Installation



### Note

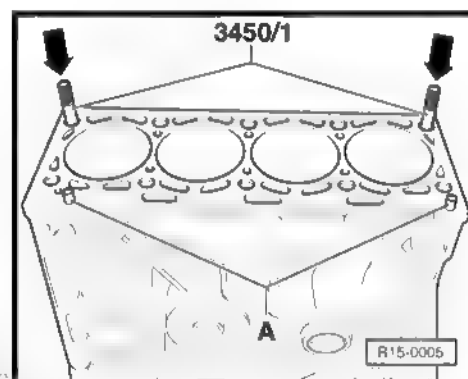
- ◆ *Remove the new engine cylinder head sealing gasket from the package immediately before installation only.*
- ◆ *Handle the new gasket as carefully as possible. Damage may cause leaks.*
- Put a clean cloth on the cylinder so as to prevent any dirt or sandpaper residues from getting in between the cylinders and the pistons.
- Also prevent dirt and sandpaper residues from getting into the cooling system.
- Carefully clean engine cylinder head and engine block sealing surfaces. Make sure that no longitudinal scrapes or scratches are produced in this operation (when using sandpaper, the grain should never be lower than 100).
- Carefully remove sandpaper residues with a cleaning cloth.
- Place the cylinder 1 piston in TDC and turn the crankshaft slightly backwards.
- To centralize the engine head, screw the Guides - 3450- into the external rear holes of engine cylinder head screws -arrows-.
- Place the new cylinder head sealing gasket onto the centering pins -A-. The inscription (spare part number) must be legible.



### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque.*

- Install the engine cylinder head and the 8 remaining new cylinder head bolts and tighten manually.
- Loosen the Guides - 3450- with the Extractor - 3450/3- through the screw holes. Turn the Puller - 3450/3- anticlockwise until the guides are loose.
- Insert the two remaining cylinder head bolts and tighten them manually.





- Tighten the cylinder head screws in the indicated tightening sequence, as follows:
- First, tighten all fastening bolts to a tightening torque of 30 Nm.
- Next, apply a 180° angle torque to the bolts, using a hard spanner.



#### Note

*There is no need to tighten the engine cylinder head screws again after the repairs.*

- Continue installation in the reverse sequence to the removal.



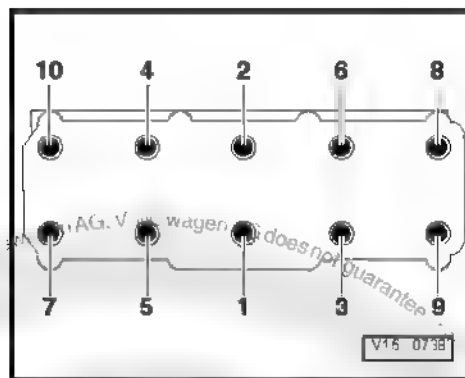
#### Note

*When turning the camshaft, the crankshaft cannot be in TDC.  
Risk of damage to the piston head/valves.*

Installing the toothed belt and adjusting the command times  
⇒ [page 59](#) .

Replenish cooling system ⇒ [page 110](#) .

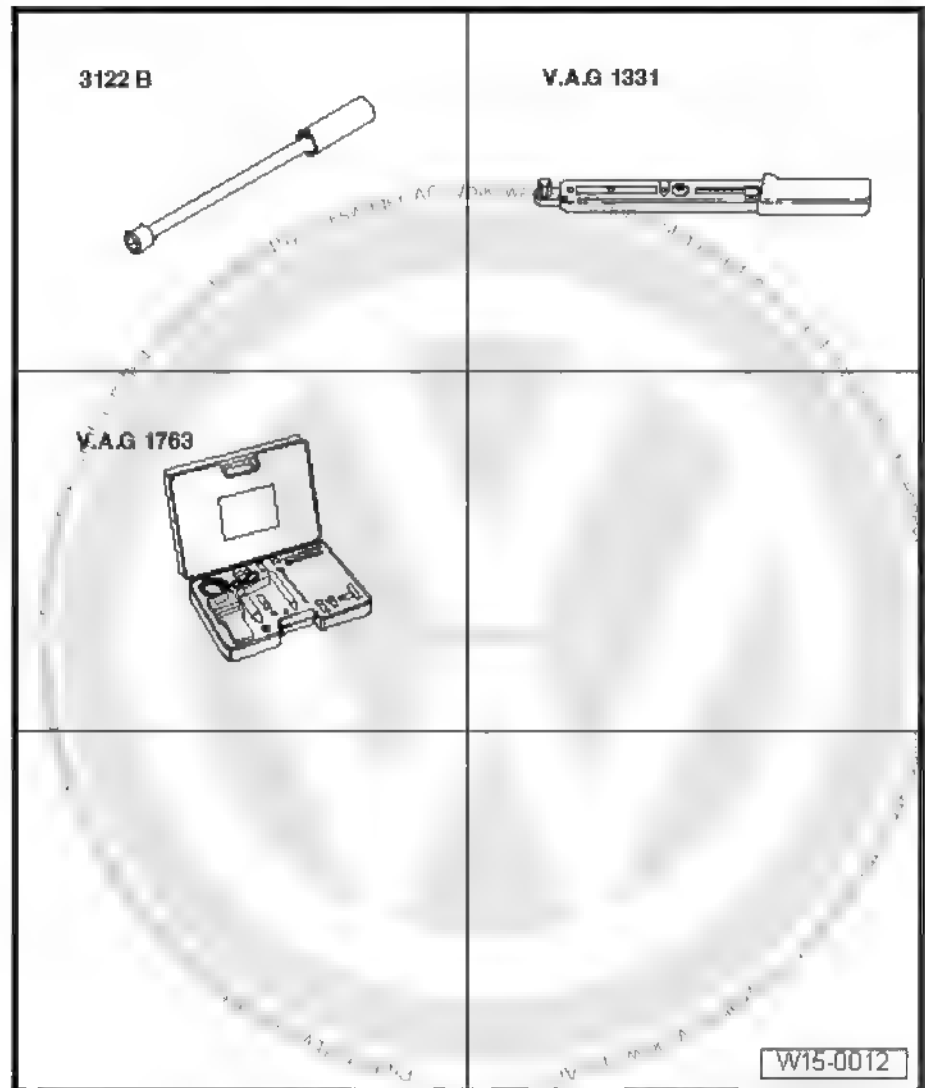
- Consult the event memory ⇒ [page 183](#) .



## 1.4 Compression - check



Special tools and workshop  
equipment required



- ◆ Spark plug wrench - 3122B-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-
- ◆ Cylinder compression gauge - petrol/ethanol - VAG 1763-

#### Test conditions

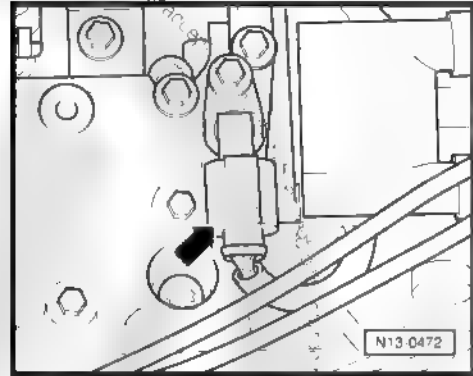
- The engine oil temperature must be at least 30°C.
- Battery - A- voltage must be at least 11.5 volts.
- All electrical components, such as lights and rear window, must be turned off.
- If the vehicle is equipped with air conditioning, turn it off.

### 1.4.1 Checking

- Remove air filter ➤ [page 170](#) .
- Disconnect connectors and remove ignition coils (CPBA engine)
- Remove the spark plugs with the Spark plug wrench - 3122B- .

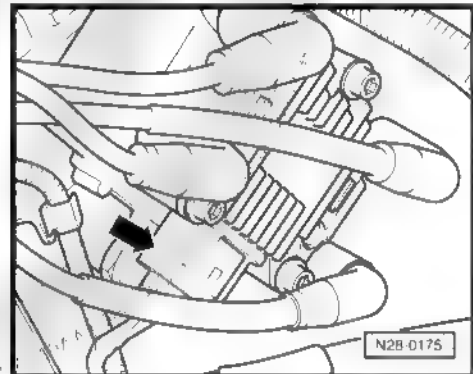


- Disconnect the 3-pole connector of the Sensor Hall - G40-  
-arrow-
- Disconnect the 4-pole connector from the Ignition transformer  
- N152- -arrow-

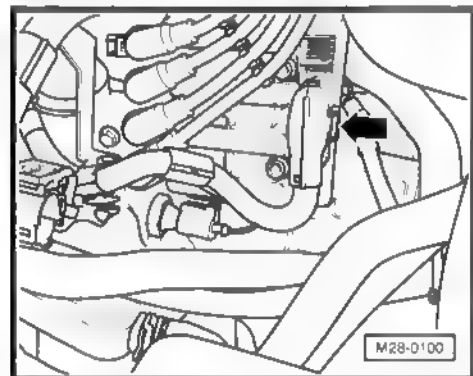


CCNA engine to 07/2009

CCNA engine as of 08/2009



- Disconnect the 6-pole connector from the Ignition transformer  
- N152- -arrow-.
- Remove connectors from Ignition coil with final power stage  
(CPBA engine).
- Remove the Ignition coils with final output stage (CPBA en-  
gine).





- Remove fuse 33 from fuse box.



**Note**

*Removing fuse 33 interrupts the power supply to the injectors.*

- Check the compression with the Cylinder compression tester - petrol/alcohol - VAG 1763- .



**Note**

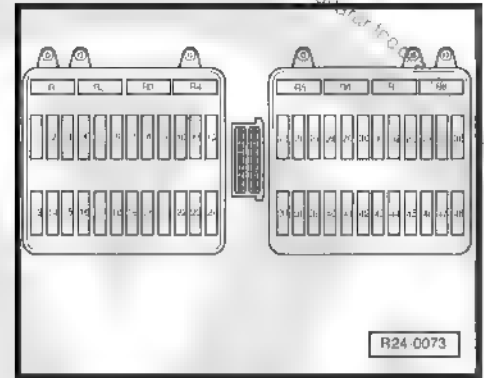
*The testing device operation is described in the respective operation instructions.*

- Request another mechanic to step on the accelerator pedal, so the throttle valve (butterfly) completely opens when the starter motor is started.
- Operate the starter motor until there is no more increase in the pressure of the testing device.

**Compression values**

Engine prefix		BJE and AQZ	BNX and CCNA	CPBA
Cylinder compression	bar	13.8 a 15.9	19.0 a 24.0	16.7 a 20.6
	bar	10.0	13.3	11.7
Wear limit	bar			
Maximum compression difference between cylinders	bar	3.00	3.00	3.00

- Install spark plugs using a Spark plug wrench - 3122B- and tighten to a torque of 30 Nm.
- Check event memory, eliminate possible present failures and, then, erase event memory ⇒ [page 183](#) .





## 2 Camshaft - repair



### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque*



### Note

- ◆ *Cylinder heads with cracks between the valve seats or between a valve seat and Spark plug - Q- threads may continue to be used without reducing the useful life, provided that such cracks are small, at most 0.5 mm wide or when only the first Spark plug - threads present cracks.*
- ◆ *Lubricate all supporting and sliding surfaces prior assembly.*
- ◆ *Use Plate - VW 5541/3- to fasten the head and valve support.*

### 1 - Camshaft

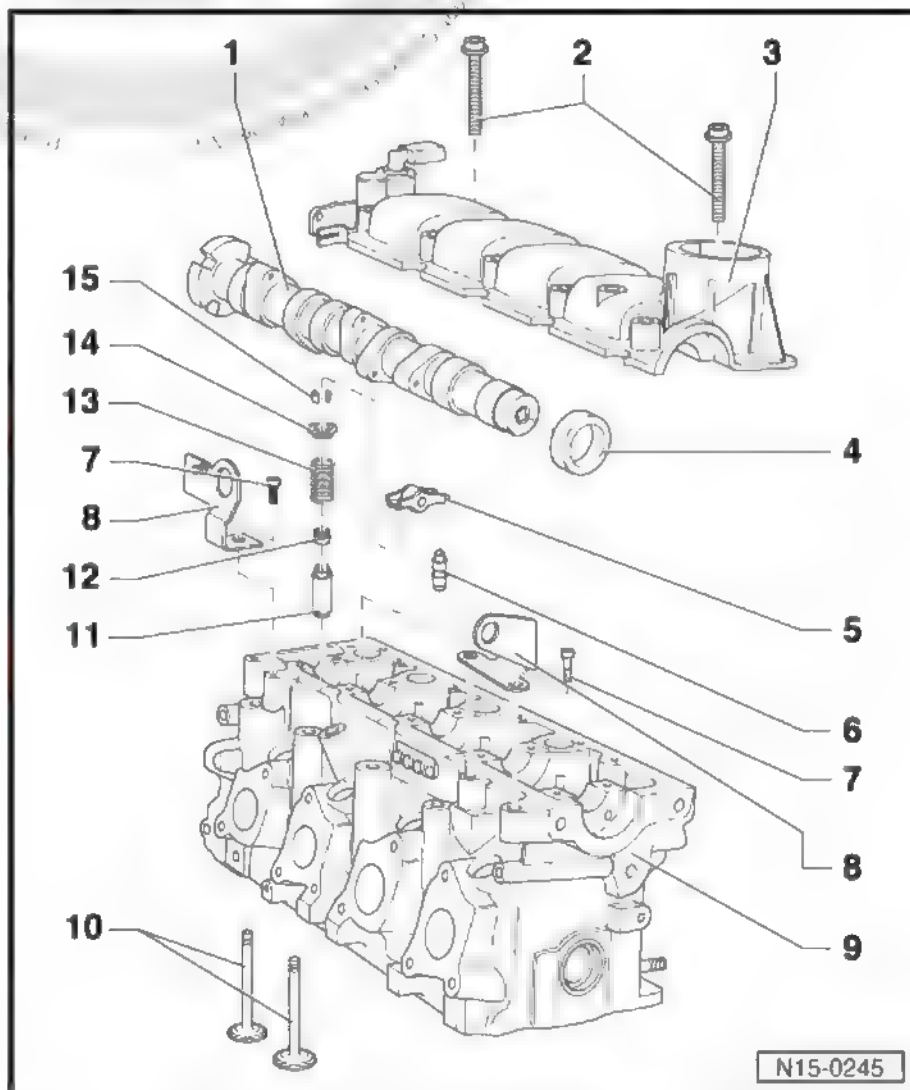
- ☐ Check axial clearance  
⇒ [page 76](#) .
- ☐ Removal and installation ⇒ [page 82](#) .
- ☐ Measure radial clearance with Plastigage, wear limit: 0.10 mm.
- ☐ Eccentricity: max. 0.05 mm.
- ☐ Code ⇒ [page 77](#)

### 2 - 6 Nm + 90°

- ☐ Replace after each removal.
- ☐ Observe installation and sequence instructions when loosening and tightening ⇒ [page 82](#) .

### 3 - Cylinder head cover

- ☐ The sealing surface must not be ground.
- ☐ With integrated camshaft bearings.
- ☐ Cover and head form a pair; therefore, the pair engraving is on the exhaust manifold side, close to Hall Sensor - G40- .
- ☐ Remove all residues of Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1-



- ☐ Apply Sealant compound for engines - AMV 188 001 02- or Sealant compound for engines - D 154 103 A1- before positioning.
- ☐ For installation, place it vertically on the holes of the cylinder head with guide pins.





- ☐ Removal and installation ➔ [page 82](#) .

#### 4 - Seal

##### Seal with spring

- ☐ Quickly lubricate with oil the sealing ring lip.

##### Seal without spring

- ☐ The sealing ring lip does not require lubrication.
- ☐ Replace ➔ [page 79](#).
- ☐ Install only the seal without spring for the CPBA engine.

#### 5 - Roller rockers

- ☐ Check the roller bearing.
- ☐ Lubricate the surface of the roller bearing with oil.
- ☐ For installation, loosen the safety clamp on the support element.
- ☐ Supplier "INA" with "030" engraving on the side near the spherical region.
- ☐ Supplier "GTT" with "S3011" engraving on the side near the spherical region.
- ☐ Do not mix, as in a single head only parts from the same supplier may be installed.

#### 6 - Support element

- ☐ Do not change positions.
- ☐ With valve clearance hydraulic offsetting.
- ☐ Lubricate the surface of the roller bearing with oil.
- ☐ Supplier "INA" with "I" engraving on the bottom of the support element.
- ☐ Supplier "GTT" with "GT" engraving on the bottom of the support element.
- ☐ Do not mix, as in a single head only parts from the same supplier may be installed.

#### 7 - 25 Nm

#### 8 - Lifting tackle/eyelet

- ☐ Spare part numbers: -030 103 390 F- (pulley side) -030 103 390 G- (inertia flywheel side).

#### 9 - Engine cylinder head

- ☐ The sealing surface on the camshaft side must not be ground.
- ☐ Grind valve seat ➔ [page 78](#) .
- ☐ Grind sealing surface on the engine block side ➔ [page 76](#)

#### 10 - Valves

- ☐ Do not grind, only seating is permitted.
- ☐ Valve dimensions ➔ [page 77](#)
- ☐ Remove with the Device - 2036- and the Plate - VW 5541/3- .

#### 11 - Valve guide

- ☐ Check ➔ [page 86](#) .

#### 12 - Valve stem sealant

- ☐ Replace ➔ [page 86](#) .

#### 13 - Valve spring

- ☐ Removal and installation: Cylinder head removed with Compression device - 2037- and Plate - VW 5541/3- , installed ➔ [page 86](#) .

#### 14 - Spring plate

#### 15 - Keys



#### Note

*With cylinder head removed, use the Plate - VW 5541/3-.*

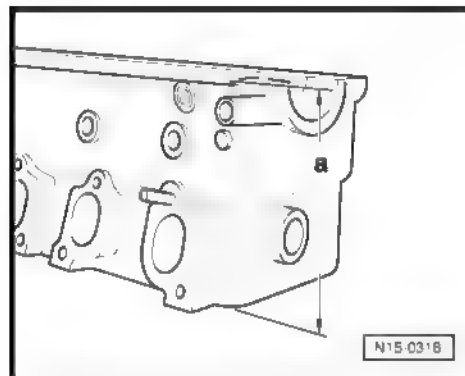
Sealing surface on the cylinder block side - grinding

Engine cylinder head grinding measurement: -a- = at least 135.6 mm.



#### Note

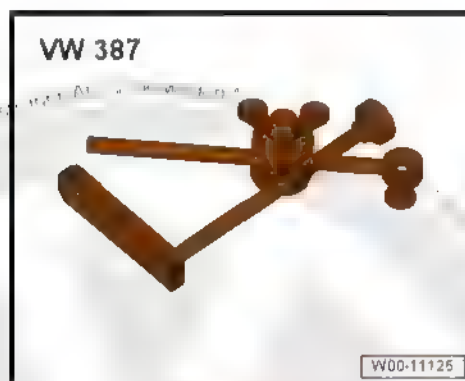
*When grinding the surface, valve seats must be ground with the same measure; otherwise, the valves would hit the pistons. Observe the minimum elevation permitted.*



## 2.1 Camshaft - check axial clearance

Special tools and workshop equipment required

- ◆ Support - VW 387-



- ◆ Dial gauge - VAS 6079-

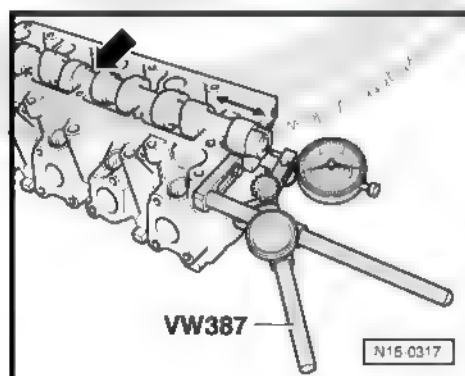


- Camshaft - check axial clearance.

Measure with support elements and camshaft cover removed.

- Press camshaft on the central bearing -arrow-, and check axial clearance moving the camshaft.

Wear limit: max 0.15 mm.





## Camshaft code

Codes between intake and exhaust cams of cylinder 4 - BJE and AQZ Engines

Cylinder 4 -arrow-	030 CE
--------------------	--------

Code between intake and exhaust cams in cylinder 4 - BNX Engine

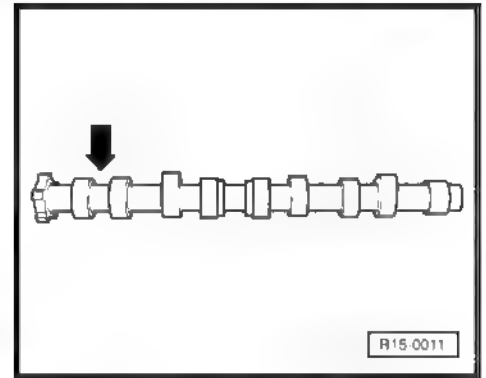
Cylinder 4 -arrow-	030 CH
--------------------	--------

Code between intake and exhaust cams in cylinder 1 - CCNA Engine

Cylinder 1 -arrow-	030 CJ and 032 AJ
--------------------	-------------------

Code between intake and exhaust cams in cylinder 1 - CPBA Engine

Cylinder 1 -arrow-	032 AH
--------------------	--------



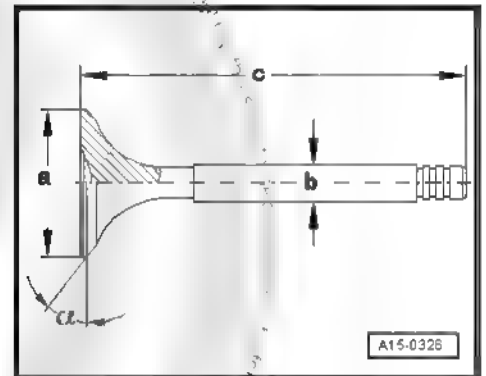
## Valves - dimensions



### Note

Valves cannot be ground. Only seating is permitted.

Dimensions		Intake valve	Exhaust valve
Ø a	mm	31.0	26.0
Ø b	mm	5.98	5.96
c	mm	99.05	99.05
α	°	45	45



## 2.1.1 Distribution times for 1-mm valve clearance

BJE and AQZ engines		Intake valve	Exhaust valve
Opens after	TDC	9.0°	-----
Closes after	BDC	34.0°	-----
Opens before	BDC	-----	33.0°
Closes before	TDC	-----	8.0°

BNX engine		Intake valve	Exhaust valve
Opens after	TDC	2.0° 30'	-----
Closes after	BDC	19 0° 30'	-----
It opens before	BDC	-----	27 0° 18'
Closes before	TDC	-----	2 0° 18'

### 030 CJ and 032 AJ Camshaft

CCNA Engine		Intake valve	Exhaust valve
Opens after	TDC	9.0°	-----
Closes after	BDC	34.0°	-----



CCNA Engine		Intake valve	Exhaust valve
Opens before	BDC	-----	30.0°
Closes before	TDC	-----	5 0°

CPBA ENGINE		Intake valve	Exhaust valve
Opens after	TDC	8° 42'	-----
Closes after	BDC	25° 42'	-----
Opens before	BDC	-----	25° 12'
Closes before	TDC	-----	8° 12'

## 2.2 Valve seat - trim

Special tools and workshop equipment required

- ◆ Depth gauge - VAS 6082-



- ◆ Valve seat grinder



### Note

- ◆ *In case of repairs on engines with leaking valves, simply grinding or replacing the seats and valves is not enough. The valve guides must also be checked for wear, especially in engines with high mileage. ➔ [page 86](#).*
- ◆ *Grind the valve seat only until a perfect fit is obtained. Calculate the maximum grinding prior to grinding. When the grinding measurement is exceeded, the hydraulic offsetting is no longer guaranteed, and the engine cylinder head must be replaced.*

### 2.2.1 Maximum trimming specification admissible - calculate

- Install valve and firmly press it against the valve seat



### Note

*If the valve is replaced during repairs, use a new valve to measure*



- Measure the distance -a- between valve end and the upper edge of the engine cylinder head.
- Calculate maximum and minimum grinding measurements of the measured distance

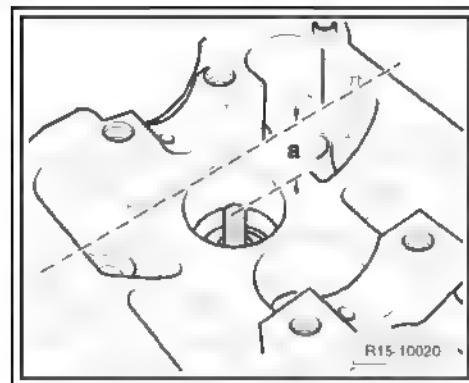
Minimum measurements: Intake valve and exhaust valve 32.1 mm.

Measured distance minus minimum distance = Maximum grinding measurement allowed.

For example:

Distance measured mm	32.5
- Minimum specification: mm	32.1
= Max. grinding specification allowed <sup>6)</sup> mm	0.4

6) The max. grinding measurement allowed is shown in the illustrations to grind the valve seats as per measurement "b"



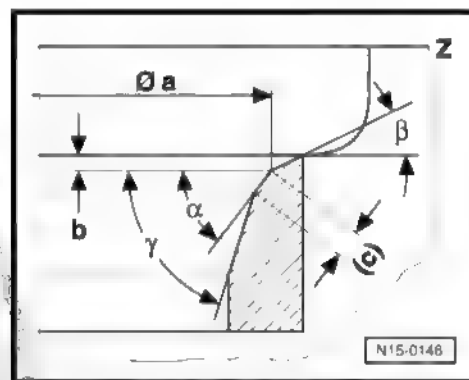
## 2.2.2 Intake valve seat - grind

- a =  $\varnothing$  29.4 mm
- b = maximum trimming dimensions admissible
- c = max. 1.8...2.0 mm
- Z = Lower cylinder head edge
- $\alpha$  = 45° Valve seat angle
- $\beta$  = 30° Upper correction angle
- $\gamma$  = 60° Lower correction angle



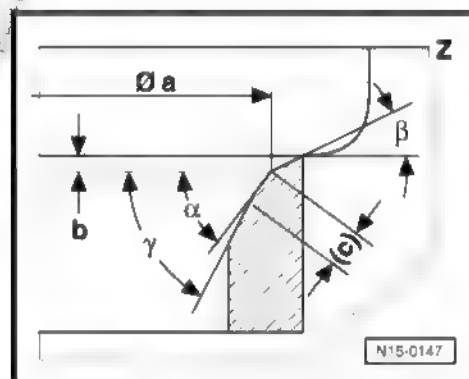
Note

*In case of valve seat rings with a narrowing, grinding must not damage the narrowing.*



## 2.2.3 Exhaust valve seat - grind

- a =  $\varnothing$  24.6 mm
- b = maximum trimming dimensions admissible
- c = max. 1.8...2.0 mm
- Z = Lower cylinder head edge
- $\alpha$  = 45° Valve seat angle
- $\beta$  = 30° Upper correction angle
- $\gamma$  = 60° Lower correction angle



## 2.3 Camshaft seal - replace

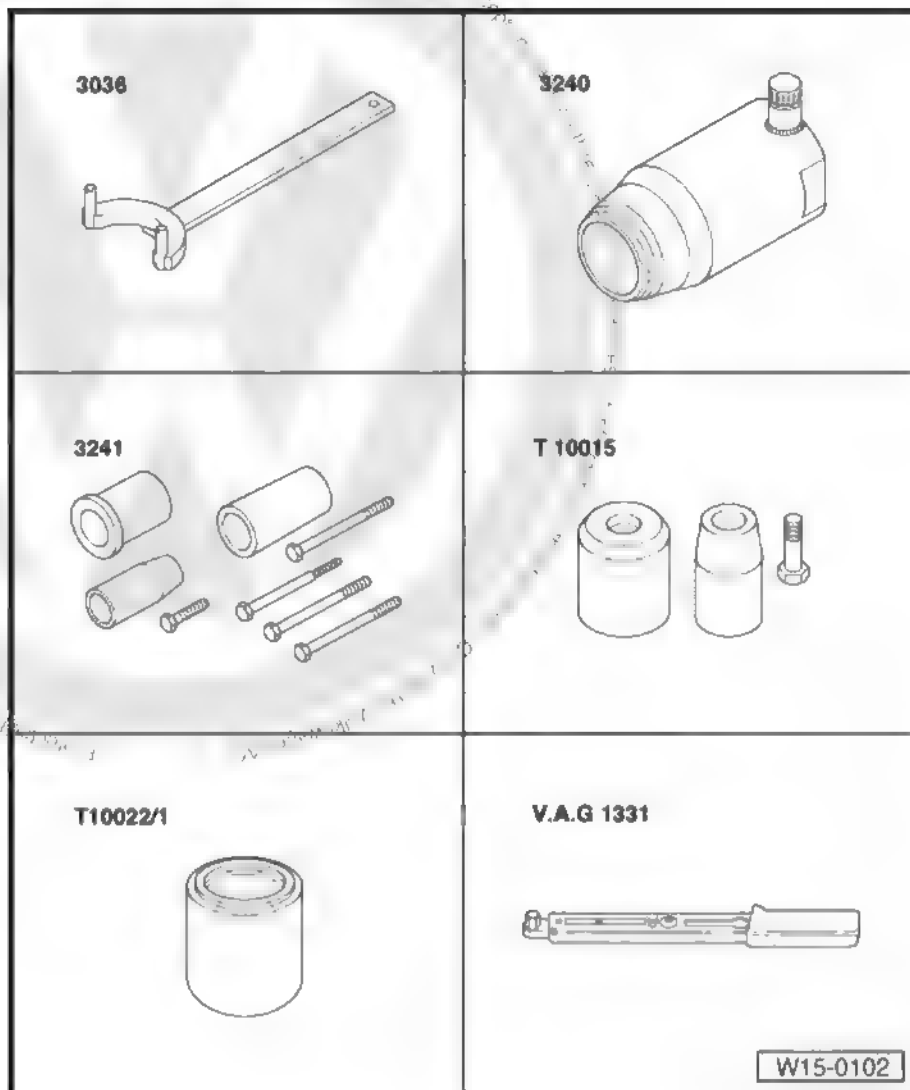


Note

- ◆ New PTFE (polytetrafluorethylene) - Teflon seal (without spring) installed from the 2nd half of December 2011.
- ◆ Not interchangeable with the front seal for the CPBA engine.



**Special tools and workshop  
equipment required**



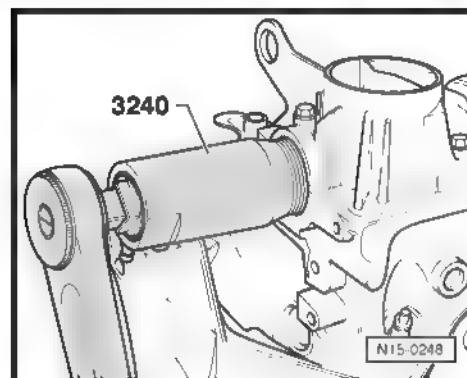
- ◆ Pin wrench - 3036-
- ◆ Puller - 3240-
- ◆ Fitting sleeves - 3241-
- ◆ Fitter - T10015/3-
- ◆ Sleeve - T10022/1-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-

### 2.3.1 Removal

- Release the tensioning pulley and remove the toothed belt from the crankshaft sprocket wheel → [page 59](#) .
- Remove the camshaft gear. To loosen the screw, immobilize the camshaft gear with a Special wrench - 3036- .
- Remove the rear cover of the mechanical distribution.
- For seal puller guide, install the camshaft gear bolt manually up to the stop on the camshaft.
- Turn the inner part of the Extractor - 3240- twice (approx. 3 mm) from the external part, and lock it with the splined screw.



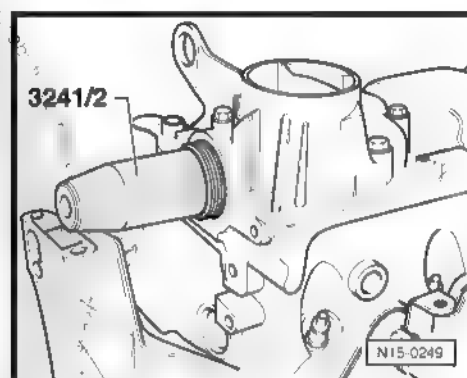
- Lubricate the puller threaded head, seat it and screw it applying as much force to the seal as possible.
- Loosen the splined bolt and turn the inner section against the camshaft until the seal is extracted
- Loosen fastening screw used in the camshaft gear.



## 2.3.2 Installation

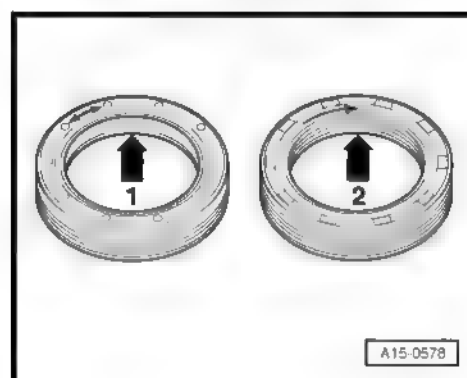
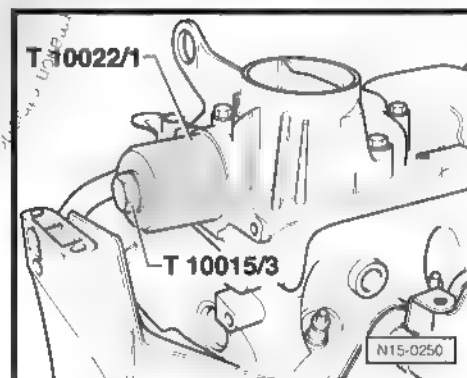
### Seal with spring

- Quickly lubricate the sealing lip of the seal with oil.
- Install the Fitting sleeves - 3241- on the camshaft trunnion.
- Slide the seal onto the Guide sleeve - 3241/2- .
- Remove the Guide sleeve - 3241/2- .

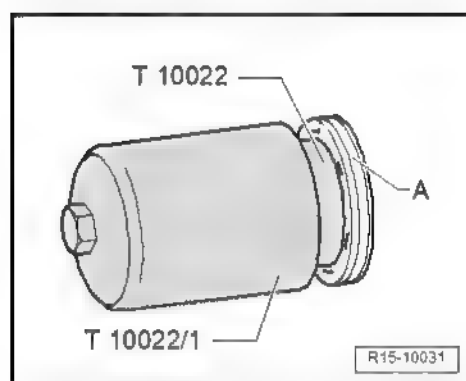
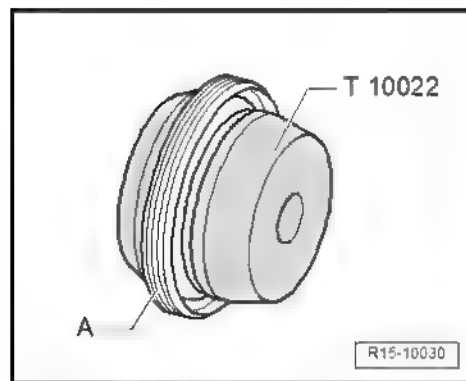


- Press the seal with the Sleeve - T10022/1- and the Fitter - T10015/3- screw up to the stop. Insert a washer between the pressure sleeve and hex screw.

### Seal without spring







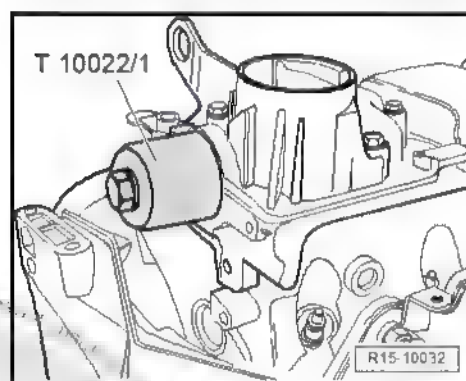
#### Note

- ◆ Introduction of the PTFE (polytetrafluorethylene) - Teflon seal.
- ◆ Characteristics: The seal with radial veins used until now only has a seal lip -arrow 1-, which is compressed by a spring. The PTFE seal has a wider sealing surface -arrow 2- and it doesn't have a spring.
- ◆ The sealing surface of PTFE seals does not require lubrication.
- ◆ Pass the seal -A- in the Assembly sleeve - T10022- with the lip facing the narrow part of the sleeve cone.
- ◆ Then, install the seal -A- in its correct installation position in the Assembly sleeve - T10022- and place the Pressure sleeve - T10022/1- with the installation bolt.
- ◆ Compress the seal with the Pressure sleeve - T10022/1- in the Assembly sleeve - T10022- through the bolt until the edge of the Pressure sleeve - T10022/1- on the cylinder head. Insert a washer between the Pressure sleeve - T10022/1- and hex bolt.
- ◆ Install the camshaft gear and tighten the new screw (utilize the Special wrench - 3036- ). Tightening torque: 20 Nm + 90°.

– Continue installation in the reverse sequence to the removal.

Installing the toothed belt and adjusting the command times

➔ [page 59](#) .



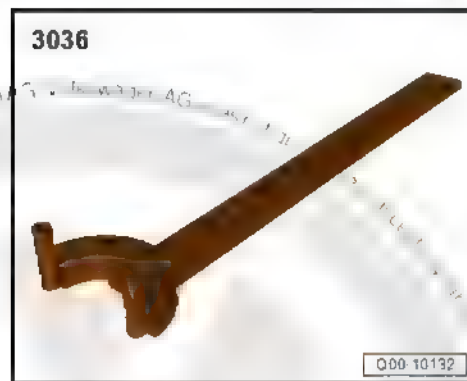
## 2.4 Camshaft and cylinder head cover - removal and installation

Special tools and workshop equipment required

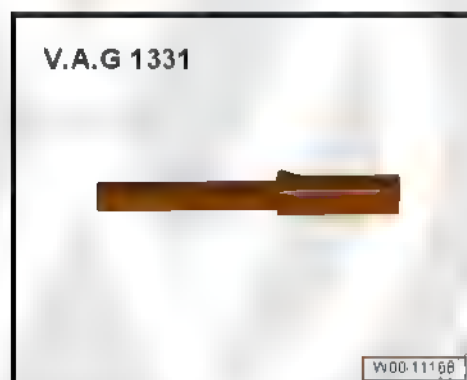




- ◆ Pin wrench - 3036-



- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-



- ◆ Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1-

## 2.4.1 Removal



### Note

- ◆ *The sealing surfaces on the cylinder head cover and on the engine cylinder head cannot be worked on.*
- ◆ *The camshaft bearings are integrated with the engine cylinder head and its cover. Before removing the cylinder head cover, loosen the toothed belt.*
- ◆ *When loosening the cylinder head cover, replace the camshaft seal.*

### Operation sequence



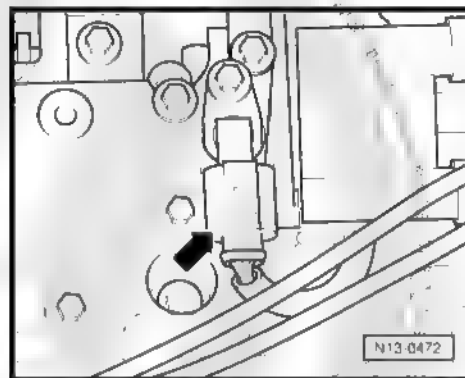
### Note

*During the work, disconnect the Battery - A- ground wire. Check if the vehicle has code radio; if so, request respective anti-theft code.*

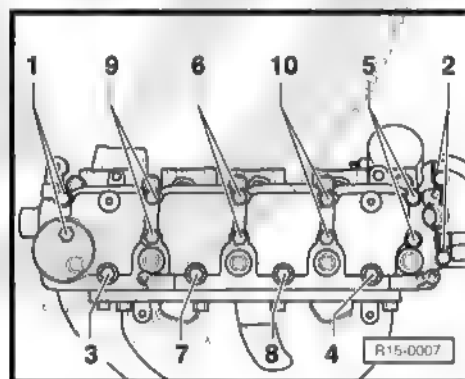
- With the ignition switched off, disconnect the Battery - A- earth wire.
- Release the toothed belt using the toothed belt - remove and install procedure, without removing the engine and tensioner support ➤ [page 59](#) .
- Remove **toothed belt** from camshaft gear.
- Remove the camshaft gear. To loosen the screw, immobilize the camshaft gear with a Special wrench - 3036- .



- Loosen the three top fastening screws on the rear cover of the mechanical distribution
- Loosen the Ignition transformer - N152- screws from the head cover of the cylinder.
- Remove the Ignition coils with final power stage (CPBA engine).
- Remove the support from Ignition coil with final power stage (CPBA engine).
- Disconnect the 3-pole connector of the Sensor Hall - G40- -arrow-.
- Remove the oil filler cap from the cylinder head cover, disengage and remove the protector.



- Loosen the engine cylinder head cover bolts in the indicated sequence, -Pos. 9 and 10- must be loosened alternately cross-wise.
- Carefully remove the cylinder head cover.
- Carefully remove the camshaft and place it on a clean surface.
- Remove the rockers together with the support elements and place them on a clean surface.
- Make sure the rockers and support elements are not mixed up.



## 2.4.2 Installation

### Conditions

- Avoid penetration of dirt and residues of Sealing compound for engine - AMV 188 001 02- or Sealing compound for engine - D 154 103 A1- in head.
- The sealing surfaces must be free of grease and oil.
- The cams on cylinder 1 must be facing upwards when installing cylinder head cover and camshaft.
- The pistons cannot be in the TDC.
- Eliminate residues of Sealing compound for engine - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- from the head and the head cover, by using a liquid solvent.
- Lubricate camshaft contact surfaces with oil



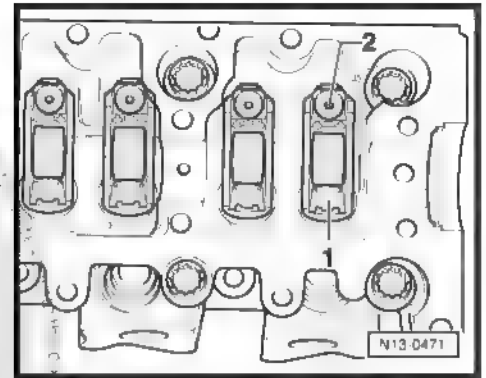
### Note

*For rocker arms and support elements we have 2 suppliers "INA" and "GTT", which can not be installed on the same cylinder head  
➔ Item 5 (page 75) ➔ Item 6 (page 75) .*

- Install support elements on the engine cylinder head and respective rockers.



- Make sure the rockers are properly positioned on the valve ends -1- and that the respective support elements -2- are properly coupled.
- Carefully install the camshaft on the engine cylinder head bearings

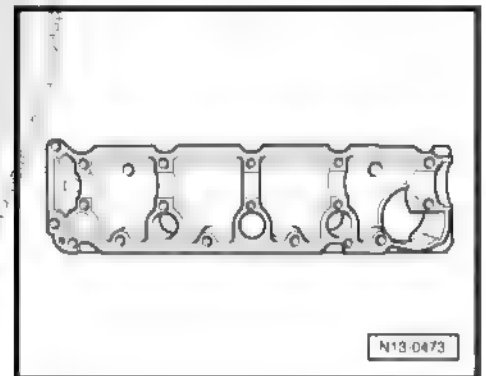


- Apply a thin and uniform film of Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- on the clean sealing surface of the cylinder head cover.



#### Note

*Do not apply a thick film of Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- otherwise, excess Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- may penetrate the lubricating grooves or camshaft bearings, causing damage to the engine.*

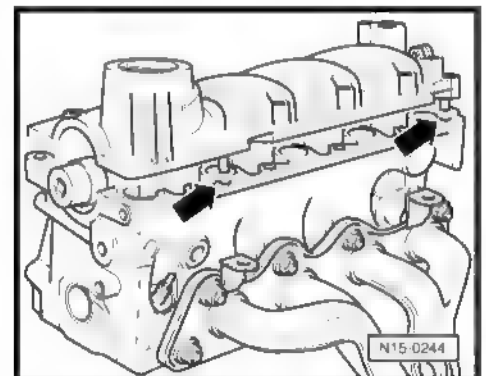


- Place the cylinder head cover carefully in the vertical position from above with the guide pins in the holes of the engine cylinder head -arrows-.



#### Note

- ◆ The cylinder head must be fit and fastened without interruptions, as the sealing surfaces start to harden as soon as they touch each other.
- ◆ The cylinder head cover screws must be replaced.

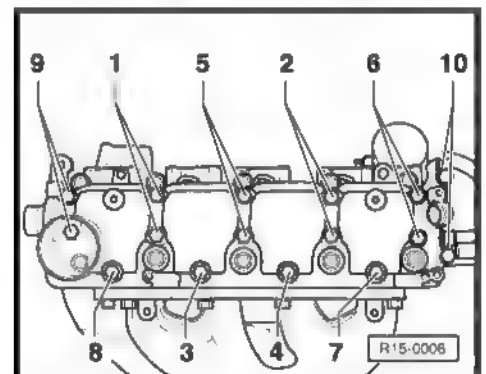


- First, tighten the bolts in -Pos. 1 and 2- alternately crosswise to 6 Nm.
- Then, tighten the other screws in the indicated sequence with 6 Nm of torque.
- Next, apply an angle torque of 90° to the bolts.



#### Note

*After the cylinder head cover has been installed, the Sealing compound for engines - AMV 188 001 02- or Sealing compound for engines - D 154 103 A1- must dry for approx. 30 minutes.*



- Install the new camshaft seal ➤ [page 79](#) .
- Continue installation in the reverse sequence to the removal.

Installing the toothed belt and regulating command times  
➤ [page 59](#) .



## 2.5 Valve guides - check

Special tools and workshop equipment required

- ◆ Support - VW 387-



- ◆ Dial gauge - VAS 6079-



### Test sequence

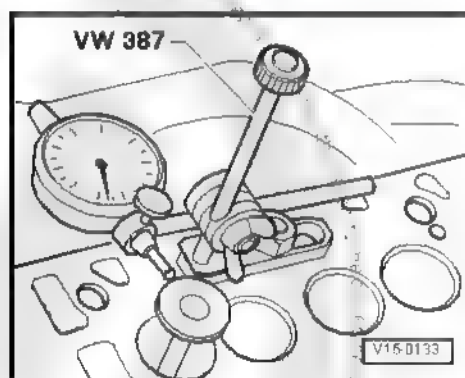
- Place a new valve on the guide. The end of the valve should be aligned with guide. Due to the various valve guide diameters, it is recommended that only one intake valve be used on the intake guide and one exhaust valve on the escape guide.
- Measure tilting gap.

Wear limit: 0.8 mm.



Note

*If the clearance is exceeded, replace the engine cylinder head.*



## 2.6 Valve stem sealant - replace


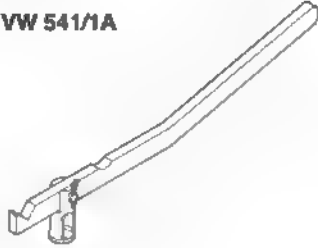

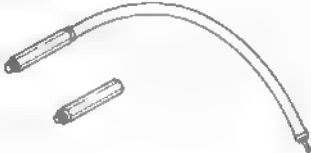
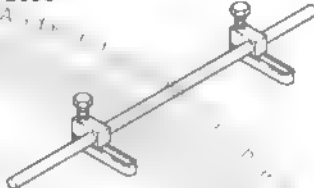
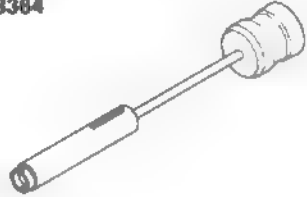


Note

- ◆ New low wear (brown colour) seal installed from the 2nd half of December 2011.
- ◆ Its removal and installation procedure is similar to the seal used up to the present.
- ◆ Not interchangeable with the front seal for the CPBA engine.



**Special tools and workshop equipment required**

<p><b>V.A.G 1331</b></p> 	<p><b>VW 541/1A</b></p> 
<p><b>VW 541/5</b></p> 	<p><b>VW 653/3</b></p> 
<p><b>2036</b></p> 	<p><b>3364</b></p>  <p><b>W15-0103</b></p>

- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-
- ◆ Lever - VW 541/1A-
- ◆ Compressor - VW 541/5- or Compressor - VW 541/50-
- ◆ Flexible tube - VW 653/2A- or Flexible tube - VW 653/3-
- ◆ Device - 2036-
- ◆ Impact puller - 3364-



◆ Seal fitter- 3365-

### 2.6.1 Removal

- Release the toothed belt using the toothed belt - remove and install procedure, without removing the engine and tensioner support ⇒ [page 59](#)
- Remove toothed belt from camshaft gear.
- Remove camshaft ⇒ [page 82](#) .
- Remove the rockers together with the support elements and place them on a clean surface.
- Make sure the rockers and support elements are not mixed up.
- Remove the Spark plugs - Q- .
- Place the piston of the respective cylinder in the "Lower Dead Centre" position.



- Fasten the Device - 2036- to the cylinder head with the screws used in the cylinder head cover.
- Screw the Flexible tube - VW 653/2A- or Flexible tube - VW 653/3- to the Spark plug - Q- thread
- Connect the pressure hose with at least 6-bar compressed air
- Remove the valve springs with a Lever - VW 541/1A- and Complement for VW 541/1A and 2037 - VW 541/5- or Compressor - VW 541/50- .



#### Note

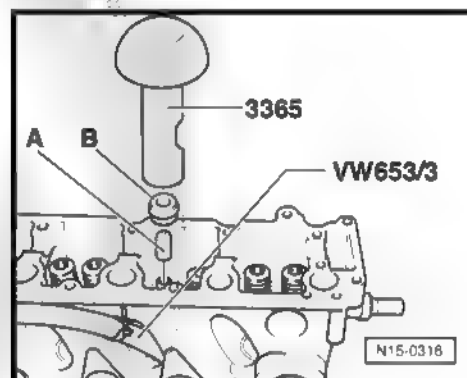
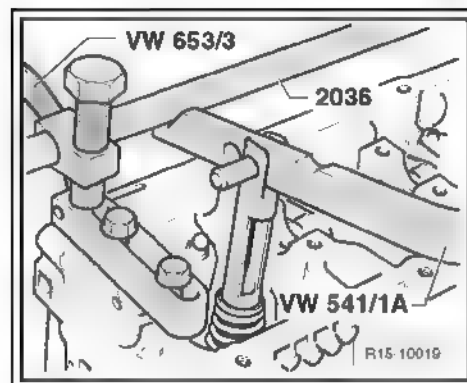
*Stuck valve keys can be loosened by tapping slightly on the installation lever.*

- Remove the valve seal with the Impact extractor - 3364- .

### 2.6.2 Installation

- Install the supplied plastic sleeve -A- into the respective valve guide. This procedure avoids damage to the new valve seal -B-.
- Place the new valve seal on the compressor with the Seal fitter - 3365- .
- Lubricate the sealing lip of the seal and carefully move it on the valve guide.

Continue installation in reverse order of removal.







## 17 – Lubrication

### 1 Lubrication system components

#### 1.1 Lubricating system components - assembly overview



#### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque.*

1 - Oil pressure switch 0.3...0.6 bar , 25 Nm - F1-

- ☐ In case of leakage, cut and replace the sealing ring.
- ☐ Tightening torque: 20 Nm.
- ☐ Check ➤ [page 101](#) .

2 - Guide tube

3 - 3 Nm

- ☐ Maximum rotation: 200 rpm.
- ☐ Fastened to the intake manifold.

4 - Oil reservoir lid

- ☐ Replace the gasket if it is damaged.

5 - Guide pipe funnel

- ☐ Remove it in case of oil drainage by absorption.

6 - Oil dipstick

- ☐ Oil level should not exceed the max. mark !
- ☐ Marks ➤ [page 92](#)

7 - Camshaft gear

- ☐ Check drive belt installation position.

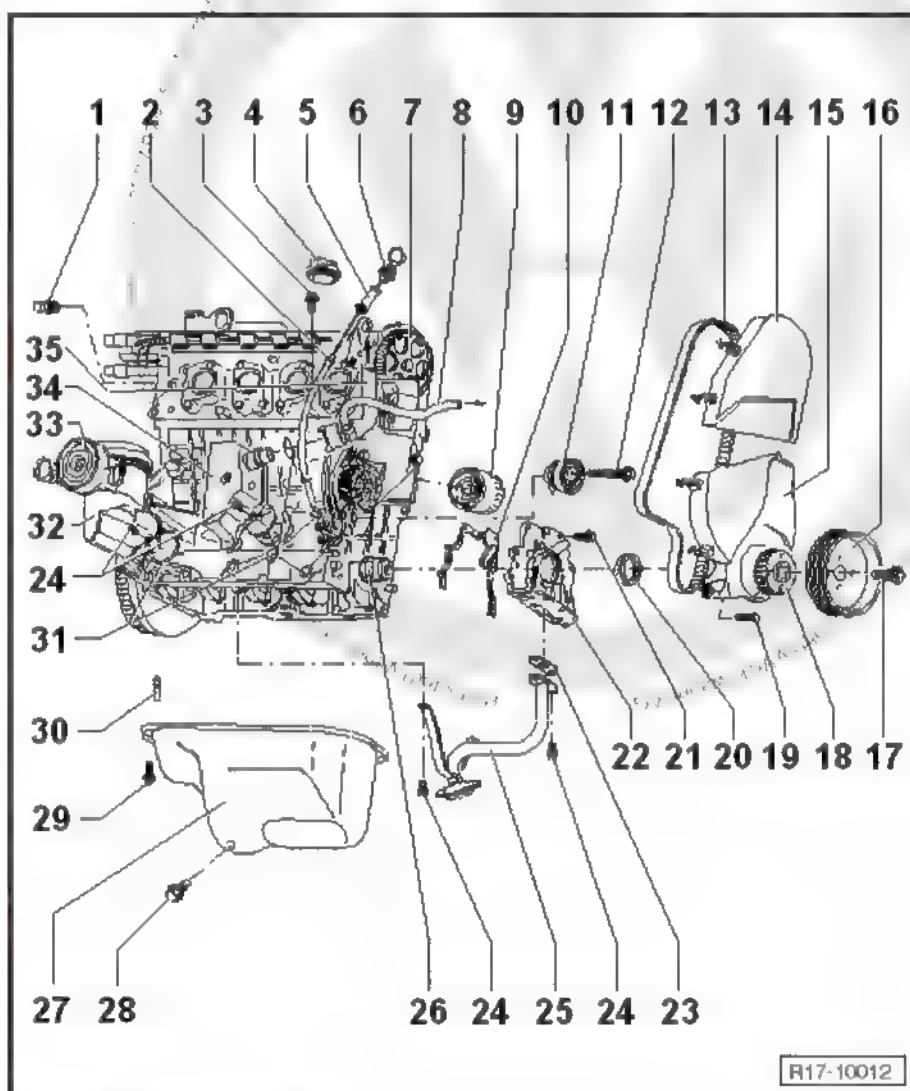
8 - Up to the intake manifold

9 - Oil filter

- ☐ Replace (vehicle on the lift) ➤ [page 94](#) .
- ☐ Follow installation instructions printed on the oil filter

10 - Gasket

- ☐ Replace
- ☐ It must be installed on the guides.







11 - Tensor pulley

- ☐ Check ➔ [page 58](#) .
- ☐ Toothed belt: remove and install, adjust ➔ [page 59](#) .

12 - 23 Nm

13 - Toothed belt

- ☐ Before removing, mark the direction of operation.
- ☐ Check for wear.
- ☐ Do not bend.
- ☐ Remove and install, adjust ➔ [page 59](#) .

14 - Upper cover to mechanical distributor

15 - Lower cover to the mechanical distributor

16 - Crankshaft pulley

- ☐ Observe fastening while installing.
- ☐ Remove and install ➔ [page 59](#) .
- ☐ Remove and install of Poly-V belt ➔ [page 59](#) .

17 - 90 Nm + 90°

- ☐ Replace after each removal.
- ☐ To loosen and tighten, use Wrench - 3415- .
- ☐ The angular torque can be performed in several stages.
- ☐ The angular torque can be measured using the Hazet 6690.

18 - Crankshaft gear

- ☐ Watch the installation position when installing the toothed belt ➔ [page 59](#) .

19 - 10 Nm

20 - Seal

- ☐ Replace ➔ [page 34](#) .

21 - 6 Nm + 40°

- ☐ Replace after each removal.

22 - Crankshaft flange/oil pump (pulley side)

- ☐ Always replace the entire assembly.
- ☐ Should fit onto adjustment guides.
- ☐ To remove and install, remove the crankcase.
- ☐ While installing, observe the crankshaft dragging element.
- ☐ Remove and install ➔ [page 96](#) .

23 - Gasket

- ☐ Replace.

24 - 10 Nm

25 - Oil suction tube

- ☐ Clean the screen filter, if dirty.
- ☐ For the plastic tube, the sealing ring does not need to be replaced upon removal and installation

26 - Dragging element

- ☐ Lubricate with oil before installing the oil pump.

27 - Crankcase

- ☐ Remove and install ➔ [page 93](#) .
- ☐ Before installing, clean the seating surface
- ☐ With Silicone sealant for engine - D 176 404 A2 ou A3- ➔ [page 93](#) .



## 28 - Oil draining plug, 30 Nm

- ☐ With sealing ring.
- ☐ Replace the plug.

## 29 - 15 Nm

- ☐ Loosen and tighten especially the screws on the flywheel side with the U/J extension and socket, 10 mm - 3220 -

## 30 - Oil nozzle and valve

- ☐ For piston cooling
- ☐ The entire assembly is tested at the factory for its opening pressure (1.5 to 1.9 bar), and shape and direction of its oil jet.
- ☐ The ejectors are fastened under pressure on the cylinder block, in the seating region of the main bearing sleeves, and should not be removed.
- ☐ If they are removed, they must be replaced in order to ensure tightness of the system.

## 31 - Seal

- ☐ Replace.

## 32 - Crankcase ventilation device with crankcase pressure control valve

- ☐ CPBA Engine.

## 33 - Crankcase pressure control valve (PCV)

- ☐ CPBA Engine.

## 34 - Crankcase ventilation device

- ☐ AQZ, BJE, BNX and CCNA engines

## 35 - Up to the air filter

## Marks on oil dipstick

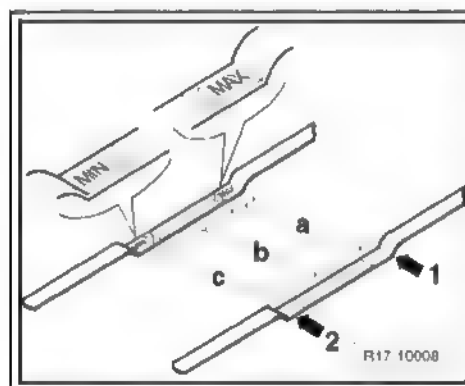
1 - Max. mark

2 - Min. marks

a - Region between the upper corner of the engraved region and the max. mark: do not refill with oil.

b - Oil level in the marked field: May be filled with oil.

c - Region between min. mark and area below the marked region: Replenish with 0.5 litre of engine oil.



## 1.2 Engine oil



### Note

- ◆ Oil level should not exceed the Max. marking due to the risk of damage to the catalytic converter! Marks ➔ [page 92](#)
- ◆ After filling, check the oil level with the oil dipstick ➔ [page 92](#)

Check oil pressure ➔ [page 101](#) .

Oil filling quantities:

- ◆ With a 3.3-litre oil filter

Engine oil specification:

- ◆ Use high lubricating capacity oils according to "VW 502 00" specification ➔ Chemicals Manual for vehicles manufactured until the 2013 production series.

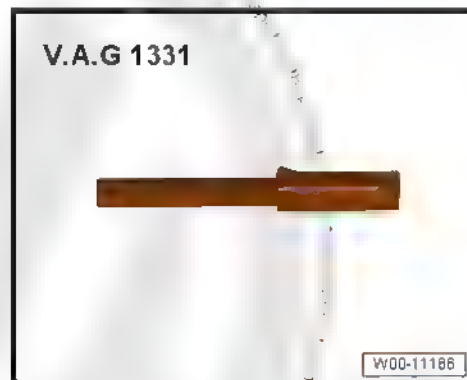


- ◆ Use high lubricating capacity oils according to VW 508 88\* specification ➤ Chemicals Manual for total flex vehicles manufactured as of the 2014 production series.

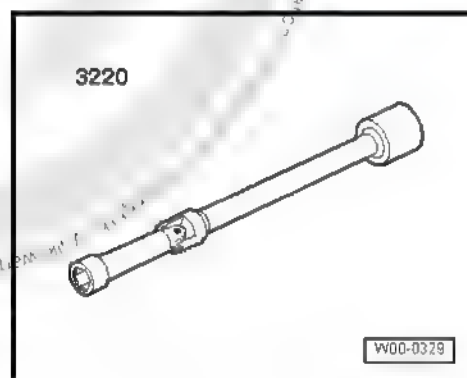
### 1.3 Oil pan- remove and install

Special tools and workshop equipment required

- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-



- ◆ U/J extension and socket, 10 mm - 3220-



- ◆ Portable drilling machine with plastic brush
- ◆ Flat spatula
- ◆ Goggles
- ◆ Silicone sealant for engines - D 176 404 A2 ou A3-

#### 1.3.1 Removal

- Remove lower noise insulation from engine compartment.
- Remove the heat deflector from the exhaust manifold.
- Loosen front tube from exhaust manifold ➤ [page 187](#) .
- Remove the clutch compartment cover.
- Drain engine oil.



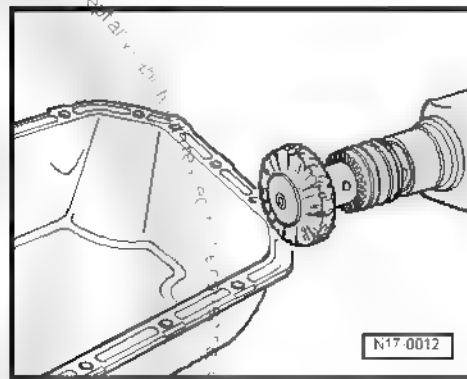
Note

*Follow the law regarding oil disposal!*

- Loosen the other fastening screws in the crankcase
- Remove crankcase. If necessary, loosen the crankcase by tapping it slightly with a rubber hammer.
- Eliminate residues of Engine silicone sealant - D 176 404 A2 ou A3- remaining on the engine block, with a flat spatula.



- Eliminate residues of Engine silicone sealant - D 176 404 A2 ou A3- from the crankcase and its cover with a rotary brush, for example, a plastic brush attached to a portable drill (wear protective goggles)
- Clean the sealing surfaces. They must be free of oil and grease



### 1.3.2 Installation



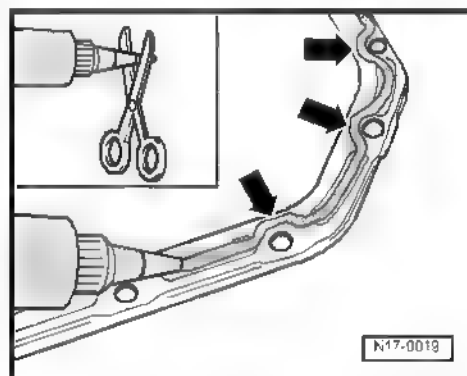
#### Note

- ♦ *Observe the use-by date for the Engine silicone sealant - D 176 404 A2 ou A3-.*
- ♦ *The crankcase and the oil pan must be installed within 5 minutes after applying the Engine silicone sealant - D 176 404 A2 ou A3-.*
- ♦ *The crankcase may be easily and safely installed by putting M 6 threaded pins in two points in the engine block flange.*
- Cut the pipe injector at the front marking ( $\varnothing$  of injector is approx. 3 mm).
- Apply the Engine silicone sealant - D 176 404 A2 ou A3- , as shown, onto clean sealing surface of the crankcase. The Engine silicone sealant - D 176 404 A2 ou A3- cord must:
  - ♦ Be 2...3 mm thick.
  - ♦ Run on inside of the area around the screw holes -arrows-.



#### Note

*The cord of Engine silicone sealant - D 176 404 A2 ou A3- may not be thicker, otherwise the excess of Engine silicone sealant - D 176 404 A2 ou A3- may reach the crankcase and obstruct the oil suction pipe filter*



- Place immediately the crankcase and insert all bolts without final torque.
- Tighten the fastening bolts to a torque of: 15 Nm.



#### Note

*Once the crankcase is installed, the Engine silicone sealant - D 176 404 A2 ou A3- must dry for approximately 30 minutes. After this period, the oil may be refilled.*

## 1.4 Oil filter - replace

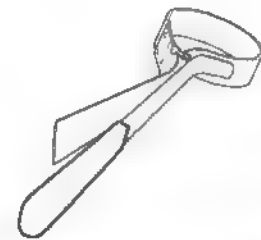
### 1.4.1 Filter with hex nut - replace

Special tools and workshop equipment required

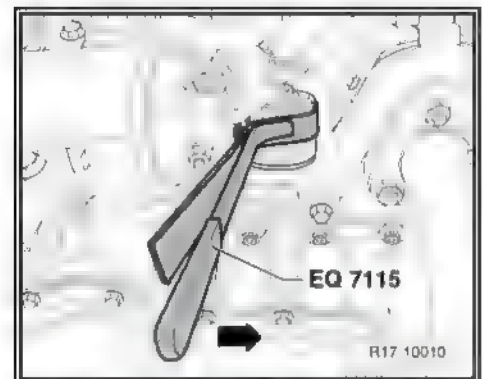
◆ Chain wrench for oil filter - EQ 7115-

- With vehicle raised, install Chain wrench for oil filter - EQ 7115- according to illustration. Then, move wrench to right towards -arrow- until you can release it manually.
- Remove the filter with your hand.
- Lubricate sealing ring with clean engine oil.
- Install the filter and apply torque manually.

EQ 7115



Q00-10101



EQ 7115

R17 10010

## 1.4.2 Filter without hex nut - replace

Special tools and workshop equipment required

- ◆ Oil filter socket (14 faces) - 3417- or Oil filter remover (14 faces) - VW 5005P-

3417



Q00-10133

- ◆ Socket wrench - T02017A-

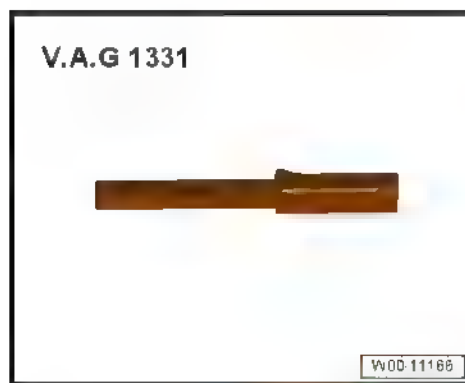
T02017A



Q00-10130



- ♦ "Torque wrench - 5 to 50 Nm ( 1/2" drive)" - VAG 1331-



- With the vehicle lifted, install the Oil filter socket (14 faces) - 3417- or Oil filter remover (14 faces) - VW 5005P- in the filter.
- Next, install the Socket wrench - T02017A- along with the articulated power cable in the Oil filter socket (14 faces) - 3417- or Oil filter remover (14 faces) - VW 5005P- .
- Move the articulated power cable to the right, releasing the filter.
- Remove the filter with your hand.
- Lubricate the new filter's sealing ring with clean engine oil.
- Manually install the filter.
- Next, install the Socket wrench - T02017A- along with the "Torque wrench - 5 to 50 Nm (1/2" drive)" - VAG 1331- , in the Oil filter wrench (14 faces) - 3417- or Oil filter remover (14 faces) - VW 5005P- .
- Move the "Torque wrench - 5 to 50 Nm ( 1/2" drive)" - VAG 1331- , to the left, applying the indicated torque engraved/ printed on the oil filter.



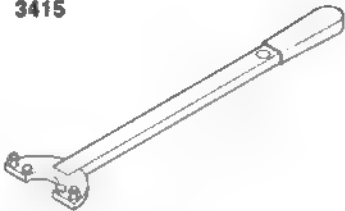

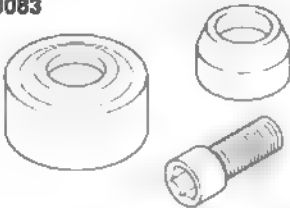


#### Note

Follow installation instructions printed on the oil filter.

## 1.5 Oil pump - remove and install



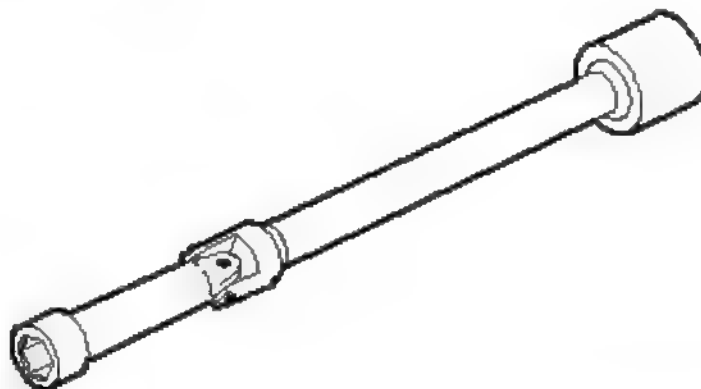
Special tools and workshop  
equipment required

<p><b>3415</b></p> 	<p><b>T 10022</b></p> 
<p><b>3083</b></p> 	<p><b>V.A.G 1331</b></p> 
<p><b>V.A.G 1332</b></p> 	<p><b>W17-0023</b></p>

- ◆ Wrench - 3415-
- ◆ Assembly sleeve - T10022-
- ◆ Fitting Device - 3083-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-
- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-



3220

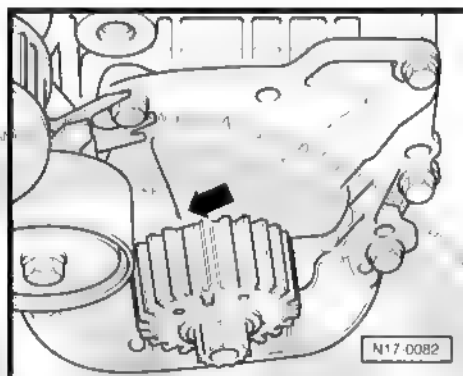


W00-0329

- ◆ U/J extension and socket, 10 mm - 3220-

### 1.5.1 Removal

- Release the tensor pulley and remove the toothed belt from the crankshaft sprocket ➔ [page 59](#) .
- Place the crankshaft in the cylinder 1 TDC -arrow-: The chamfered tooth on the crankshaft sprocket must match the "2 V" mark on the oil pump.

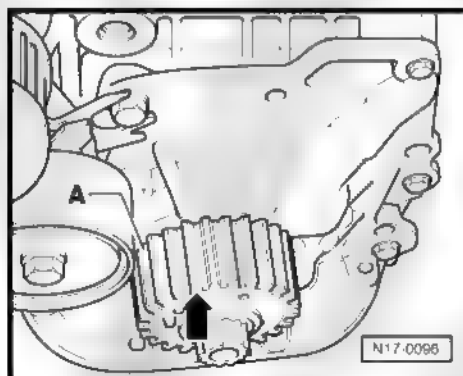


- Turn the crankshaft or gear from the TDC position, three teeth in counterclockwise direction: On the right side of the gear chamfered tooth -A-, the third tooth -arrow- must be aligned with the TDC mark "2 V" on the oil pump housing.



#### Note

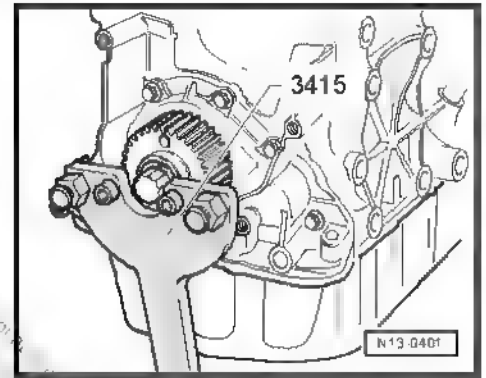
*With this adjustment, the crankshaft is in position for oil pump installation. One of the four dragging polygonal cams on the crankshaft will be on top.*







- Remove the crankshaft gear after immobilizing it with a Wrench - 3415- .
- Remove the toothed belt tensioning roller
- Remove the oil sump ➔ [page 93](#) .
- Remove the oil suction pipe ➔ [Item 25 \(page 91\)](#) .
- Remove oil pump.
- Remove the sealing gasket.
- Remove seal residues from the engine block with a flat spatula.
- Clean the sealing surfaces, which must be free of grease and oil.

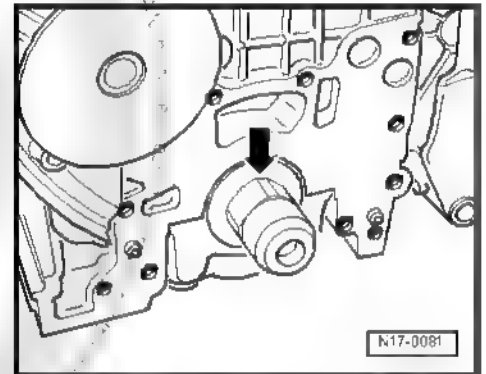


## 1.5.2 Installation

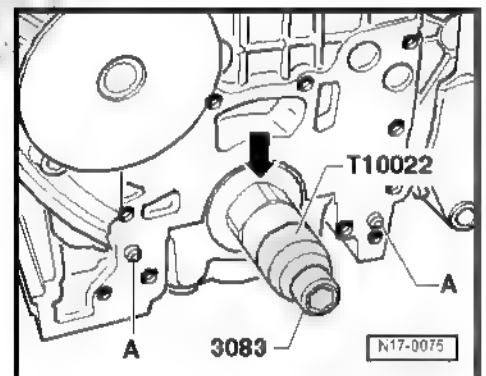
Condition:

- One of the four dragging polygonal cams on the crankshaft should be on top -arrow-.

Operation sequence:



- Position the Allen screw of the Fitting Device - 3083- with an Assembly sleeve, T10022- on the crankshaft and tighten manually.
- Place the new sealing gasket onto the guides -A-.





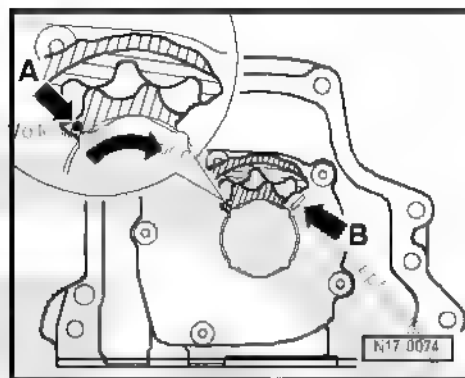
- Put the -arrow A- mark of the oil pump inner rotor in the installation position - -arrow B- mark of the oil pump housing cover
- Apply oil to the four dragging polygonal cams on the crankshaft.
- Carefully place the oil pump on the four dragging polygonal cams on the crankshaft.
- If necessary, align the inner rotor by slightly by turning the four dragging polygonal cams on the crankshaft.
- Then carefully move the oil pump over the guides.
- Screw in the oil pump. Tightening torque: 6 Nm + 40°.
- Remove the Assembly sleeve - T40022- .
- Install the oil suction pipe ⇒ [Item 25 \(page 91\)](#) .
- Install the oil pan ⇒ [page 93](#) .

Installing the toothed belt and adjusting the command times  
⇒ [page 59](#) .

## 1.6 Oil pressure switch - F1- - remove and install

Special tools and workshop equipment required

- ♦ 24 mm articulated socket - T40175-
- ♦ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-



Removal:



Caution

*Protect the components below with a cleaning cloth in order to prevent damages from leaking engine oil.*



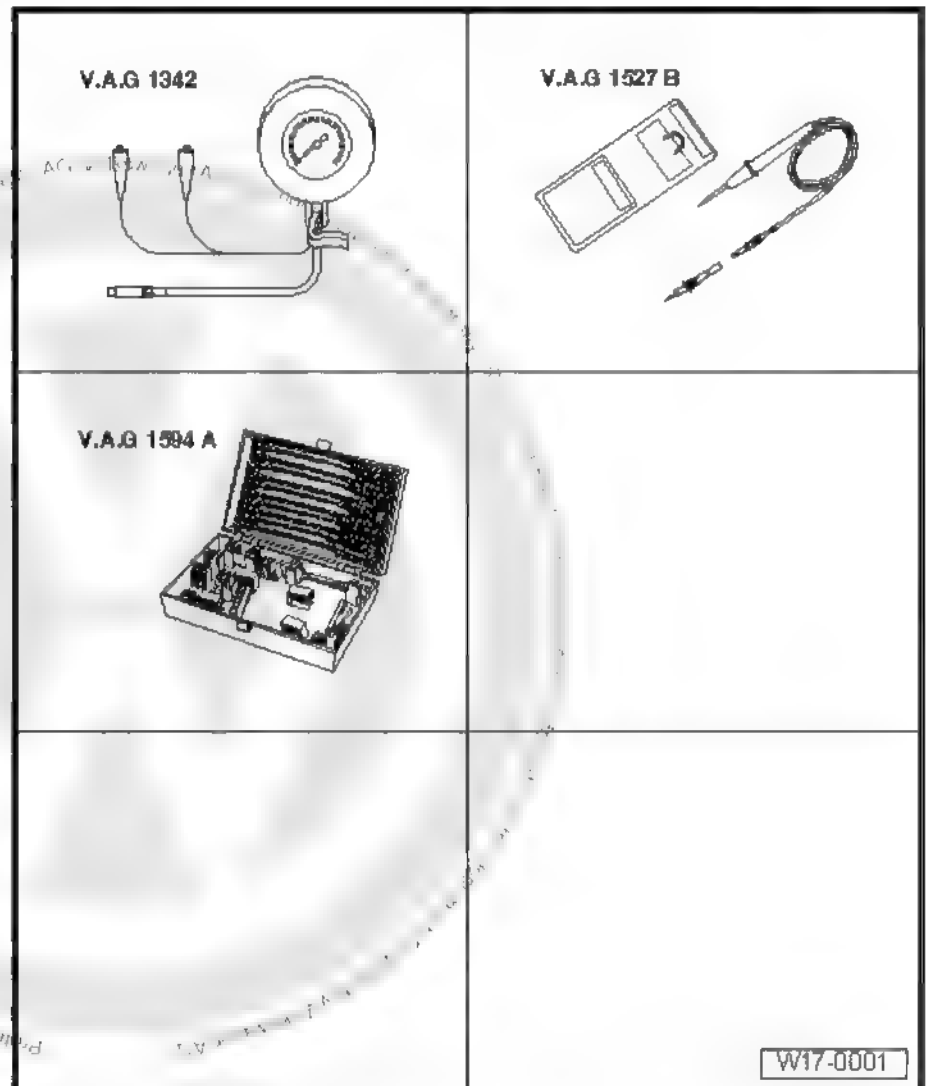
- Disengage the connector.
- Remove the Oil pressure switch - F1- from the engine cylinder head.

**Installation:**

- Install the Oil pressure switch - F1- on the engine cylinder head as quickly as possible and apply a tightening torque of 20 Nm.
- Connect the connector.
- Remove the cleaning cloth from underneath the Oil pressure switch - F1- .

## 1.7 Oil pressure and Oil pressure switch - F1- - check

Special tools and workshop equipment required



- ◆ Oil pressure gauge - VAG 1342-
- ◆ Test probe - EQ 7300- or Test probe - VAG 1527B-
- ◆ Auxiliary measuring cable set - VAG 1594C-

**Test conditions:**

- Check that the engine oil level is correct ➔ [page 92](#)
- Engine oil temperature must be at least 80 °C (the Radiator fan - V7- must have worked once).



#### Note

*Operation and repair test of visual and acoustic oil pressure indicator ➔ Current flow diagrams, Electrical fault finding and Fitting locations*

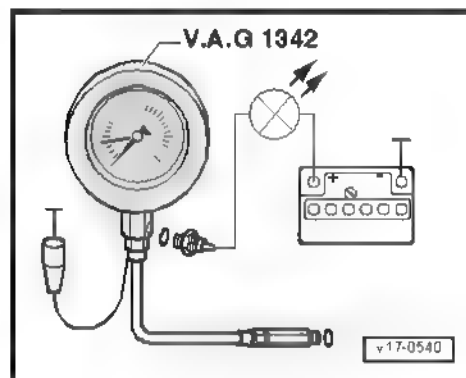
#### Test sequence:

- Remove Oil pressure switch - F1- and install onto Oil pressure gauge - VAG 1342- .
- Install the Oil pressure meter - VAG 1342- in place of the Oil pressure switch - F1- on the engine cylinder head.
- Connect brown cable from the Oil pressure gauge - VAG 1342- to the ground (-).
- Connect the Test tip - EQ 7300- or Test tip - VAG 1527B- with the Auxiliary measurement cable set - VAG 1594C- to the positive terminal of the Battery - A- (+) and the Oil pressure switch - F1- . The LED shall not light up.
- If the LED does light up, replace the Oil pressure switch - F1- .

#### If the LED does not light up:

- Operate the engine and increase the speed slowly. With 0.3...0.6-bar pressure, the LED should light up, otherwise, replace Oil pressure switch - F1- .
- Continue to increase engine speed. At 2000 rpm and an oil temperature of 80°C, the oil pressure should be at least 2.0 bar.

At higher speeds, oil pressure must not exceed 7.0 bar.





## 19 – Cooling

### 1 Cooling system components - remove and install



#### WARNING

*Whilst working within the engine compartment in particular, due to the limited space available, take the following into account:*

- ◆ *All hoses (e.g. fuel, hydraulics, activated charcoal filter system, cooling system and cooling gas, brake fluid vacuum) and electric cables must be restored to their original positions.*
- ◆ *Allow easy access to all the moving or hot parts.*



#### Note

- ◆ *The cooling system is under pressure when the engine is hot. Thus, it is necessary to reduce the pressure before conducting repairs.*
- ◆ *Hose connection are fastened by spring clamps. For repairs, use spring clamps only.*
- ◆ *To install spring clamps, we recommend using the Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A- or the Clamp pliers - VAG 1921-.*
- ◆ *The cooling system hoses should be installed without tension and without coming into contact with other components (observe the marks on the hose).*

Check the cooling system leaks with the Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B- and the VAG 1274 adaptor - VAG 1274/8- and the VAG 1274 adaptor - VAG 1274/9-.

Cooling system components, body side ⇒ [page 103](#).

Cooling system components, engine side ⇒ [page 105](#).

Cooling system hoses connection diagram ⇒ [page 107](#).

Drain and replenish the cooling system ⇒ [page 110](#).

Coolant preparation instructions ⇒ [page 113](#).

#### 1.1 Cooling system components, body side



# 1 - Radiator

- ☐ Remove and install  
➤ [page 119](#) .
- ☐ After replacement,  
change all coolant.

# 2 - Seal

- ☐ Replace

# 3 - Upper hose of the cooling system

- ☐ Fastened to the radiator  
with a clip.
- ☐ Make sure it is well fastened.
- ☐ Cooling system hoses  
connection diagram  
➤ [page 107](#) .

# 4 - Air deflector

# 5 - 5 Nm

# 6 - Right radiator fan. - V35-

- ☐ In vehicles with air conditioning  
system up to  
March 20, 2006.

# 7 - Clip

- ☐ Make sure it is well fastened.

# 8 - Support

- ☐ Of the Radiator fan -  
V7- .

# 9 - Connector

- ☐ Of the Radiator fan -  
V7- .

# 10 - Radiator fan - V7-

# 11 - For cooling system thermostat valve body

- ☐ Cooling system hose connection diagram ➤ [page 107](#) .

# 12 - Coolant reservoir

Check for cooling system leaks using the Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B- with the Adapter for VAG 1274 - VAG 1274/8- .

# 13 - Cap

Check for cooling system leaks using the Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B- and the Adapter for VAG 1274 - VAG 1274/9- .

- ☐ Test pressure 1.4...1.6 bar (vehicles without air conditioning).
- ☐ Test pressure 1.6...1.8 bar (vehicles with air conditioning).

# 14 - Support

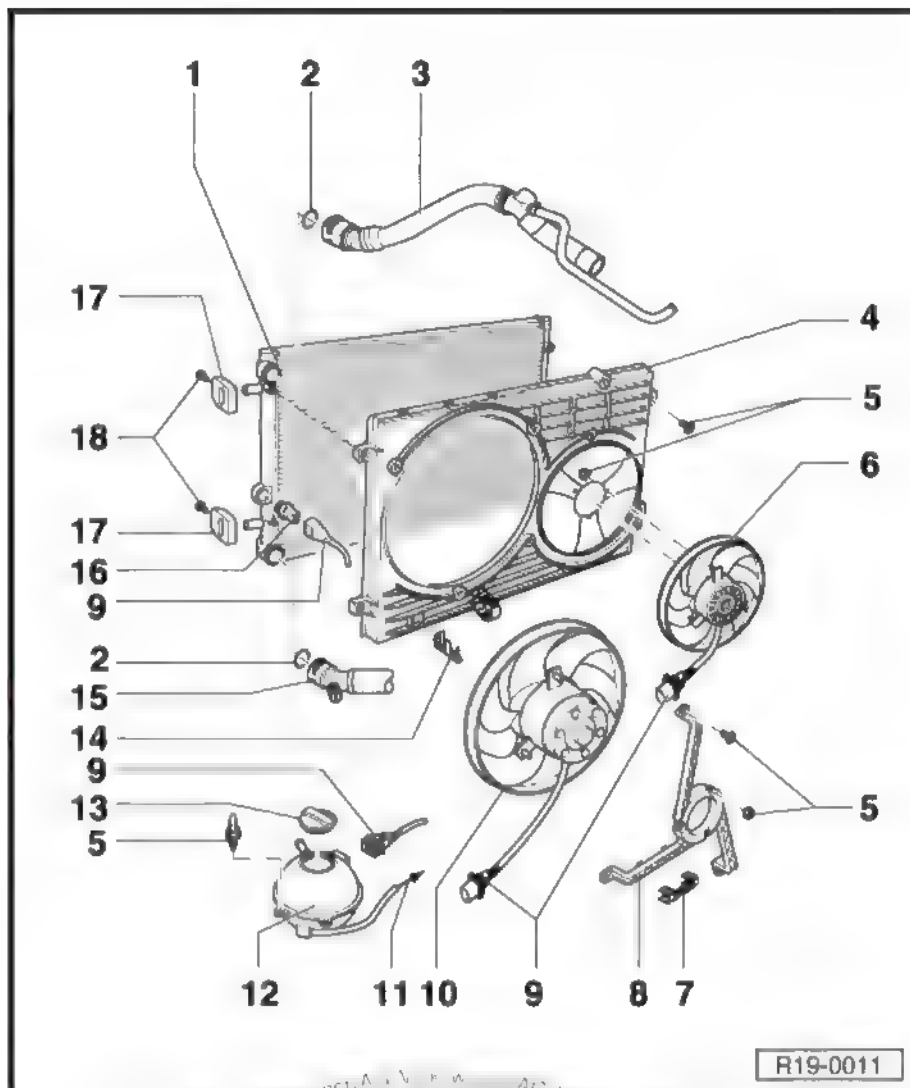
- ☐ For the Radiator fan - V7- connector

# 15 - Lower hose of the cooling system

- ☐ Fastened to the radiator with retaining clip.
- ☐ Make sure it is well fastened.
- ☐ Cooling system hose connection diagram ➤ [page 107](#) .

# 16 - radiator fan thermal switch - F18-

- ☐ 35 Nm.







- ☐ Of the Radiator fan - V7- .
- ☐ Not applicable.

#### 17 - Support

- ☐ For radiator.
- ☐ Observe installation position.
- ☐ Observe various models.

18 - 5 Nm

## 1.2 Cooling system components, engine side

### 1 - Flange

2 - 9 Nm

### 3 - Seal

- ☐ Replace.

### 4 - Thermostatic valve

- ☐ Check proper operation:  
Heat the valve in water.  
The thermal element pin  
should move outwards.
- ☐ Temperature test:  
Opening beginning at  
78...82°C and with min-  
imum opening of 8 mm  
at 95°C may not be car-  
ried out.

### 5 - To the heat exchanger

- ☐ Cooling system hose  
connection diagram  
⇒ [page 107](#) .

### 6 - From the coolant tank

- ☐ Cooling system hose  
connection diagram  
⇒ [page 107](#) .

### 7 - Thermostat valve housing

### 8 - From the heat exchanger

- ☐ Cooling system hose  
connection diagram  
⇒ [page 107](#) .

### 9 - Cooling system tube

- ☐ Cooling system hose  
connection diagram  
⇒ [page 107](#) .

### 10 - Seal

- ☐ Replace

### 11 - Engine block water pump housing

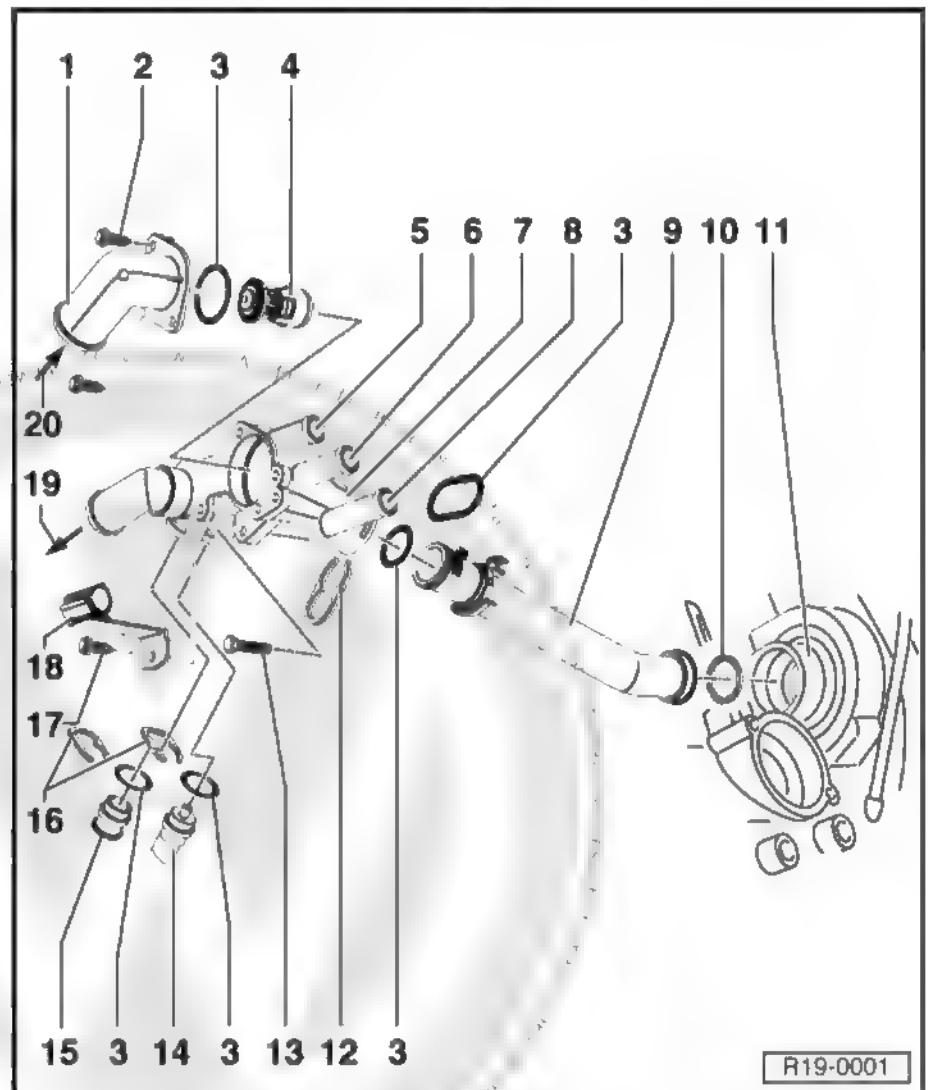
### 12 - Clip

- ☐ Make sure it is well fastened.

13 - 10 Nm

### 14 - Coolant temperature sensor - G62-

- ☐ With Sensor for the coolant temperature indicator - G2- .





- ☐ For Engine control unit - J623- .
- ☐ If necessary, depressurize the system before removal

#### 15 - Sealing plug

- ☐ If necessary, depressurize the system before removal

#### 16 - Clip

- ☐ Make sure it is well fastened.

#### 17 - Bolt

- ☐ Tightening torque 6 Nm.

#### 18 - Support

#### 19 - For the radiator, below

- ☐ Cooling system hose connection diagram ⇒ [page 107](#) .

#### 20 - For radiator, on top

- ☐ Cooling system hose connection diagram ⇒ [page 107](#) .

### 1.2.1 Water pump side



#### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque.*





### 1 - Water pump

- ☐ Replace the sealing gasket if it is damaged
- ☐ Check smooth operation.
- ☐ Remove and install  
➤ [page 121](#) .

### 2 - Mechanical distribution rear cover

### 3 - Camshaft gear

- ☐ Check the fastening during installation.
- ☐ Check the installation position of toothed belt  
➤ [page 59](#) .

### 4 - 20 Nm + 90°

- ☐ Replace after each removal.
- ☐ To loosen and tighten, immobilize the camshaft gear with the Special wrench - 3036- .

### 5 - Toothed belt

- ☐ Mark rotation direction before removal.
- ☐ Check for wear.
- ☐ Do not bend.
- ☐ Remove and install, adjust  
➤ [page 59](#) .

### 6 - Upper cover to mechanical distributor

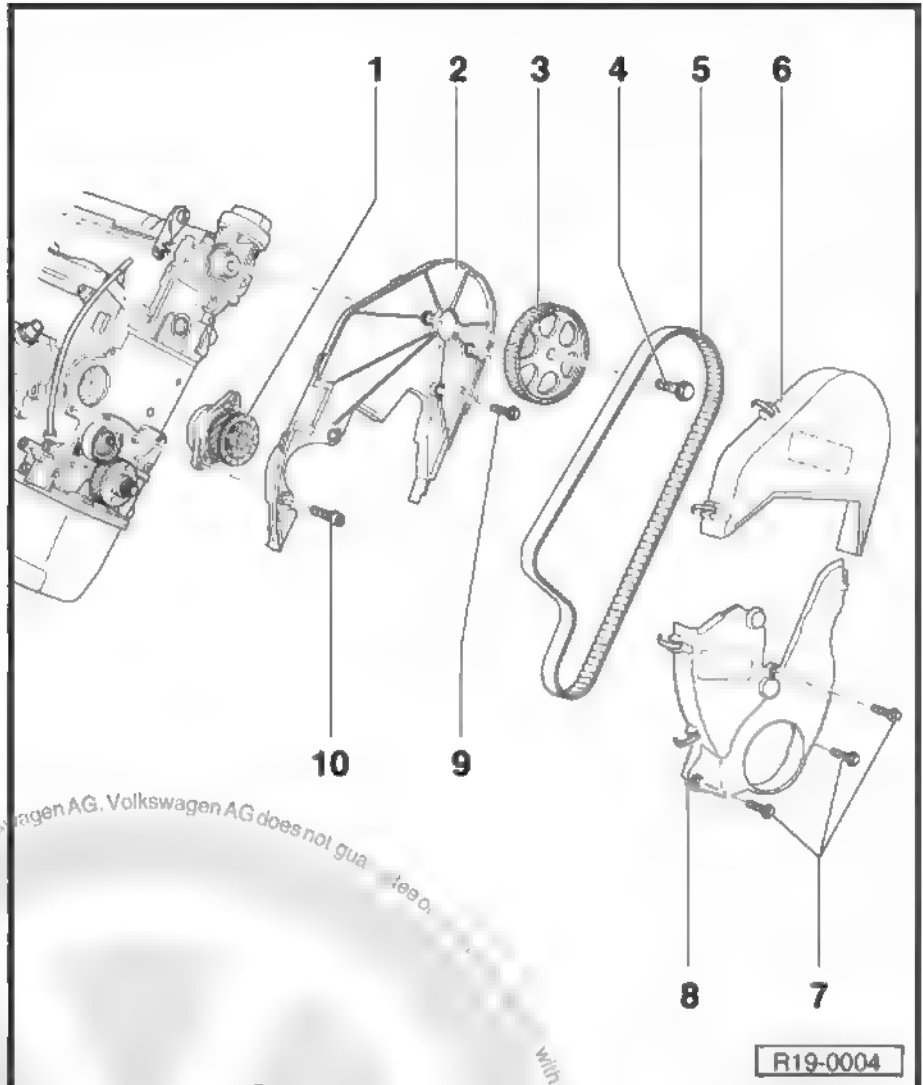
### 7 - 10 Nm

### 8 - Lower cover to the mechanical distributor

### 9 - 10 Nm

- ☐ Apply Liquid sealant - D 000 600 A2- .

### 10 - 20 Nm

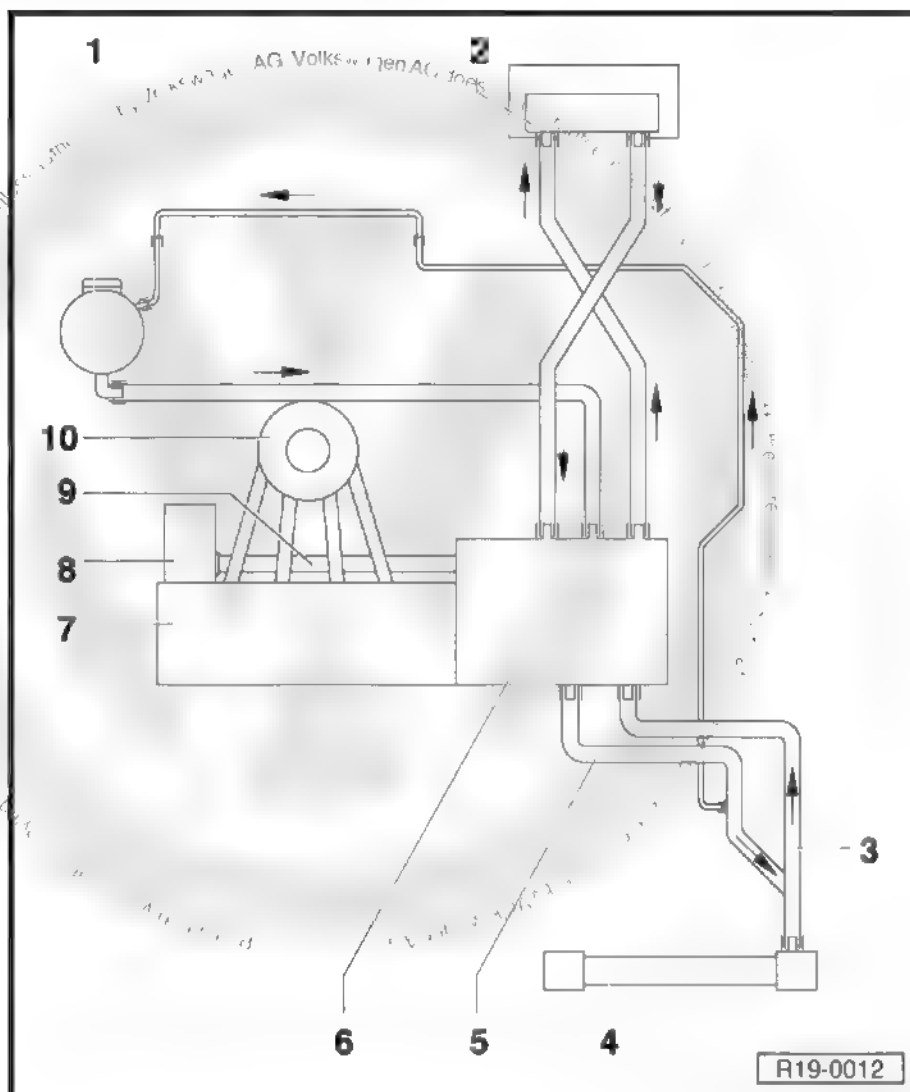


## 1.3 Hose connection diagram for cooling system

AQZ, BJE and BNX engines



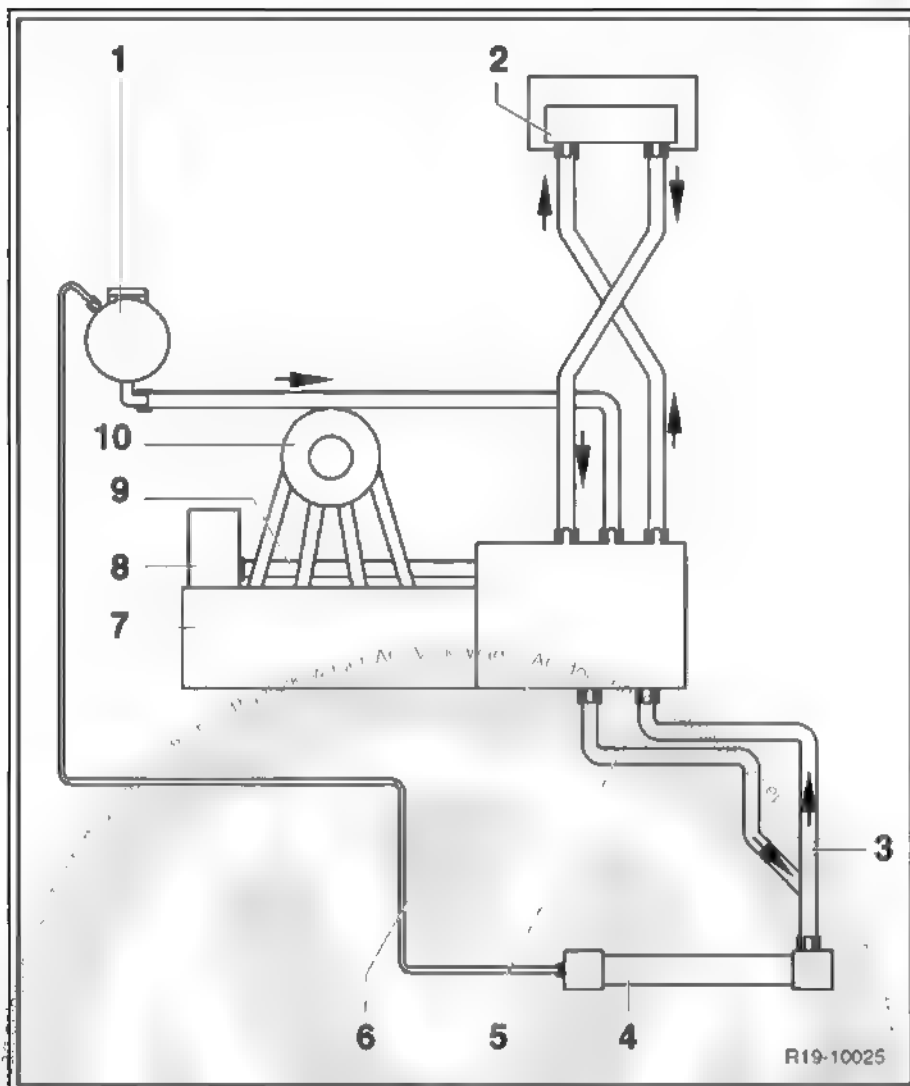
- 1 - Coolant reservoir
- 2 - Heat exchanger
- 3 - Lower hose of the cooling system
- 4 - Radiator
- 5 - Upper hose of the cooling system
- 6 - Thermostat valve housing
- 7 - Engine cylinder head / engine block
- 8 - Water pump
- 9 - Cooling system tube
- 10 - Intake manifold



CCNA and CPBA engines



- 1 - Coolant reservoir
- 2 - Heat exchanger
- 3 - Lower hose of the cooling system
- 4 - Radiator
- 5 - Upper hose of the cooling system
- 6 - Thermostat valve housing
- 7 - Engine cylinder head / engine block
- 8 - Water pump
- 9 - Cooling system tube
- 10 - Intake manifold





## 1.4 Cooling system - drainage and replenishment

Special tools and workshop equipment required



- ◆ Refractometer - T10007A-
- ◆ Oil collector - VAG 1306- or Oil collector - VAS 6208-
- ◆ Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A- or Clamp pliers - VAG 1921- or Clamp pliers - VAS 6340-
- ◆ Cooling system supply unit - VAS 6096-
- ◆ Adapter for VAG 1274 - VAG 1274/8-



## V.A.G 1274 B



W00-11247

- ◆ Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B-

### 1.4.1 Drain



#### WARNING

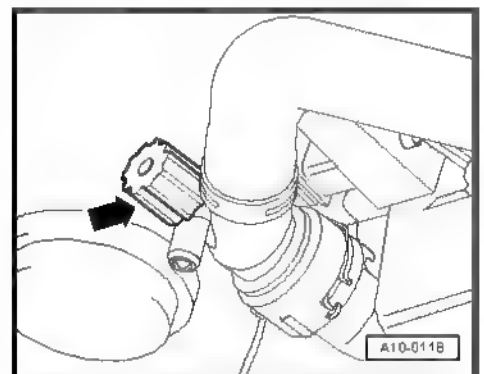
*Hot vapours may escape when the coolant reservoir is opened; cover it with a cloth and open carefully.*

- Remove coolant expansion tank lid.
- Remove lower noise insulation from engine compartment.

#### With draining device

- Disconnect the drainage device from the radiator cooling system -arrow-.

#### Without draining device



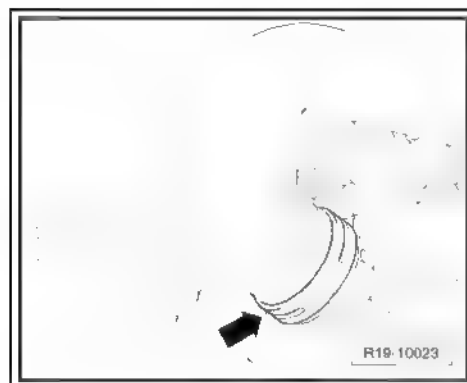


– Release the lower hose at the radiator (left side) -arrow-



**Note**

*Follow the recommendations for coolant disposal!!*





## 1.4.2 Replenishing



### Note

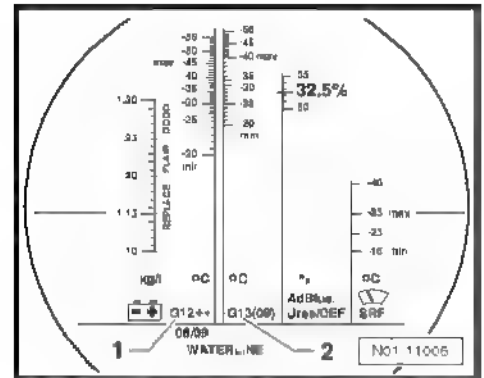
- ◆ One of the elements that most affect coolant efficiency is the water used in its preparation. The quality of the water to be used is based on multiple substances, which may present different specifications depending on the country or even in different regions. Fresh water meets all requirements. Therefore, the coolant must be prepared with fresh and drinkable water, either when preparing new filling procedures or coolants used to top off the coolant tank.
- ◆ Only the antifreeze additive may be used. Correspondence: ➔ Electronic Parts Catalogue "ETKA" It is identified by the pink colour.
- ◆ Do not mix antifreeze additive with other types of antifreeze additives from other suppliers under any circumstance.
- ◆ A brown colour in the coolant reservoir indicates that the antifreeze additive has been mixed with other antifreeze additives. In this case, replace all of the coolant.
- ◆ The antifreeze additive prevents damages caused due to corrosion, freezing, or slob sedimentation, further increasing the coolant's boiling temperature. Therefore, the cooling system must always have the recommended mixture of antifreeze and anti-corrosion products.
- ◆ Due to the high boiling temperatures it provides, antifreeze is especially helpful in tropical countries, ensuring safe operation when the engine is submitted to heavy-duty work.
- ◆ Antifreeze protection must be assured to approximately  $-25^{\circ}\text{C}$  (in countries with Arctic climates, to approximately  $-35^{\circ}\text{C}$ ).
- ◆ Coolant concentration must not be diluted by adding fresh and drinkable water during hot seasons, or in countries with hot climates. The percentage of antifreeze should be at least 40 %.
- ◆ If the climate requires greater antifreeze protection, the antifreeze additive percentage may be increased, but to a maximum of 60 % (antifreeze protection up to  $-40^{\circ}\text{C}$ ). The higher proportion lowers cooling capacity and antifreeze protection.
- ◆ Use the Refractometer - T10007A- to determine the antifreeze protection and the corresponding antifreeze protection percentage.
- ◆ Do not reuse used coolants, including in situations in which drainage is required.
- ◆ Use only clean drinkable water to prepare the coolant.

Recommended proportions:

Antifreeze protection up to	Antifreeze proportion	Coolant additive <sup>7)</sup>	Water <sup>7)</sup>
$-25^{\circ}\text{C}$	40 %	2.25 l	3.35 l
$-35^{\circ}\text{C}$	50 %	2.8 l	2.8 l

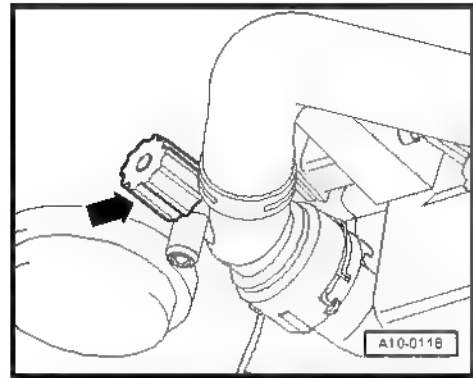
<sup>7)</sup> The coolant volume may vary according to the equipment on each vehicle

With draining device

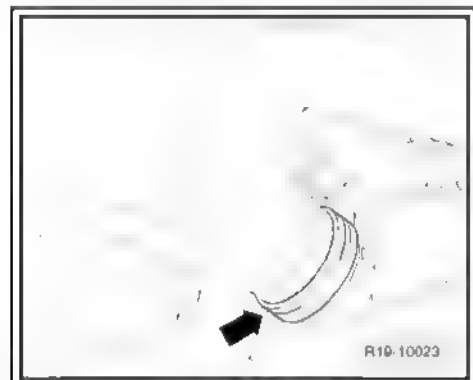




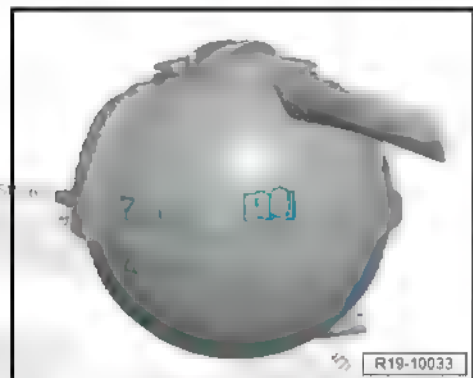
- Close the drainage device -arrow- of the cooling system.  
Without draining device



- Fit the lower hose on the radiator (left side) -arrow-.
  - Install engine compartment lower noise insulation.
- With the Cooling system supply unit - VAS 6096-



- Remove coolant expansion tank lid.
- Install the Adaptor for VAG 1274 - VAG 1274/8- on the coolant tank.

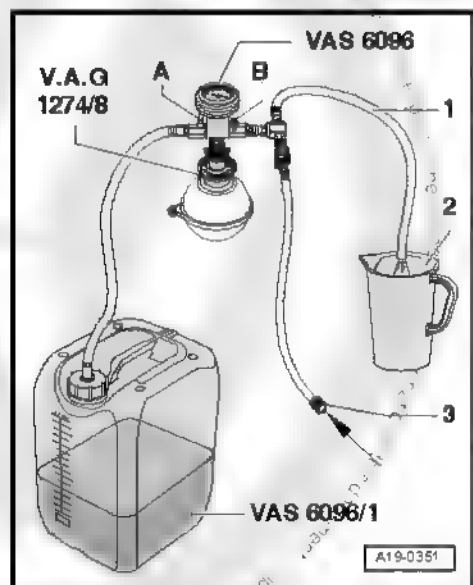


- Install the Cooling system supply unit - VAS 6096- .



**Note**

*A small quantity of coolant is removed along with the air discharge, which must be collected.*

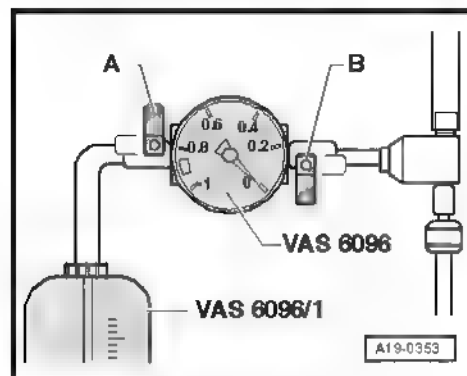






- Close the valves -A- and -B-, allowing levers to seat transversely to the passage direction
- Connect the hose -3- to the compressed air system.

The compressed air pressure must be 6 to 10 bar.



- Open the valve -B- placing the lever in the passage direction.

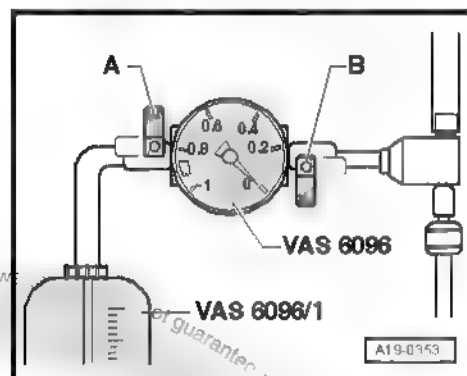
The aspiration jet pump generates vacuum in the cooling system; the instrument gauge must move towards the green area.

- Briefly open valve -A- placing the valve in the direction of the flow, in order to fill the Cooling system supply unit - VAS 6096- coolant reservoir hose with coolant.
- Close valve -A-.
- Leave valve -B- open for more than 2 minutes.

The aspiration jet pump continues to generate vacuum in the cooling system; the instrument gauge must stay in the green area.

- Close valve -B-.

The instrument gauge must remain still in the green area; the vacuum in the cooling system is sufficient to ensure proper supply.



#### Note

- ◆ If the gauge is below the green area, the operation must be repeated.
- ◆ If the vacuum reduces, check the cooling system for exhaust points.

- Remove the compressed air hose.
- Open the valve -A-.

Due to the vacuum in the cooling system, the coolant is aspirated from the Cooling system supply unit - VAS 6096- into the cooling system.

- Remove the Cooling system supply unit - VAS 6096- and the VAG 1274 adaptor - VAG 1274/8- from the coolant tank
- Supply the coolant tank until the maximum mark.



- Install the coolant tank cap.

Without the Cooling system supply unit - VAS 6096-

- Remove coolant expansion tank lid.
- Supply the coolant tank until reaching the maximum mark.
- Install the Adaptor for VAG 1274 - VAG 1274/8- on the coolant tank.
- Attach the Connection terminal - V.A.G 1274 B/1- to the VAG 1274B adaptor - VAG 1274/8- .

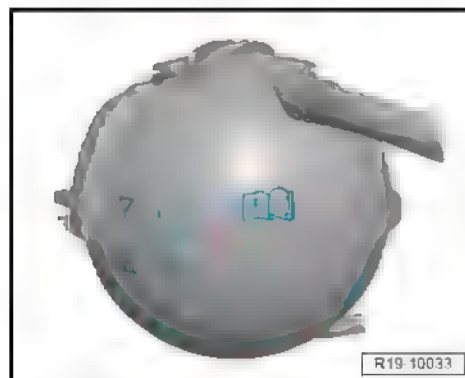
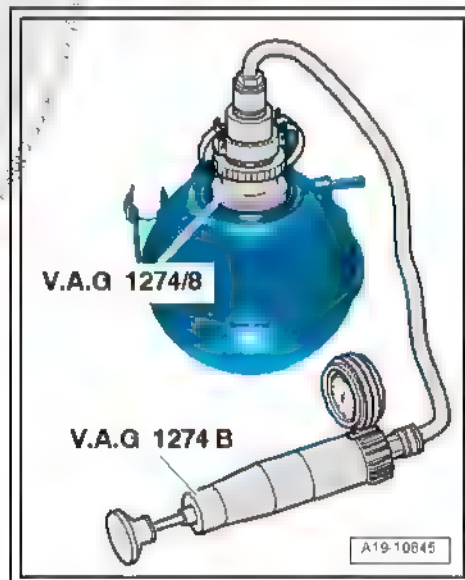
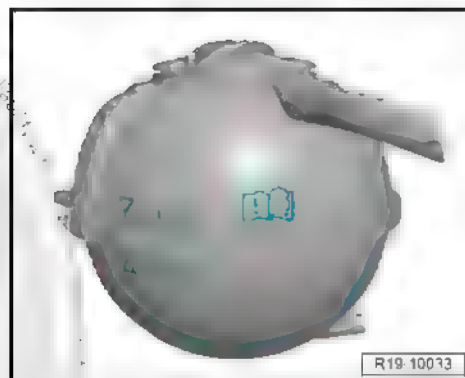
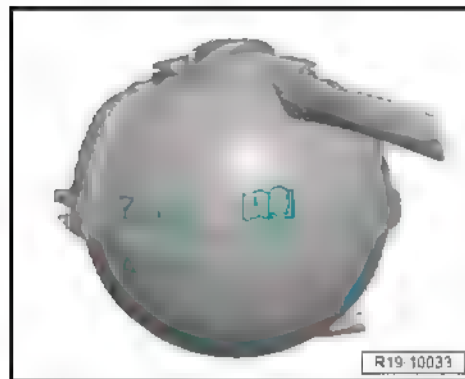
- Connect the Connection terminal - V.A.G 1274 B/1- to the Engine cooling system analyzer - VAG 1274 B- through the flexible connection tube.
- With the Engine cooling system analyzer - VAG 1274B- , generate a pressure of approx. 1.5 bar.



**DANGER!**

*Risk of burns! Before removing the Engine cooling system analyzer - VAG 1274B- from the VAG 1274 adaptor - VAG 1274/8- and the Connection terminal - V.A.G 1274 B/1- , eliminate all system pressure. Press the pressure relief valve in the Engine cooling system analyzer - VAG 1274B- , until the manometer reads »0«.*

- Supply the coolant tank until the upper edge.





- Install the coolant tank cap.
- Switch off the air conditioning, if applicable.
- Turn off heating start device.
- Start the engine and keep it idling until it is heated
- Maintain engine rotation at approx. 3800 rpm, until the Radiator fan - V7- is activated.
- After the Radiator fan - V7- is activated, maintain engine rotation at approx. 3800 rpm for an additional 5 minutes.
- Switch the engine off.



#### WARNING

*When opened, hot vapours may come from the coolant tank. Wear protection goggles and clothing to prevent eye injuries and burns. Place a cloth on the tank flap and open it carefully.*

- Check coolant level and top off if necessary.
- With the engine under normal operating temperature, the coolant may be at the "max." mark or above.
- With the cold engine, the coolant level must be between the "min. mark" and "max. mark".



#### WARNING

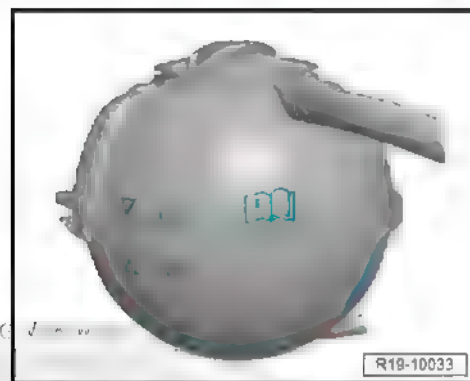
*Hot vapours may escape when the coolant reservoir is opened; cover it with a cloth and open carefully.*

- Check coolant level and, if necessary, top it up. When the engine is hot, coolant level should be at the max. mark; when the engine is cold, it should be at the central mark, between the max. and min. marks.

## 1.5 Cooling system - check air-tightness

Special tools and workshop equipment required

- ◆ Engine cooling system tester - VAG 1274- or Engine cooling system tester - VAG 1274B-





- ◆ Adapter for VAG 1274 - VAG 1274/8-



- ◆ Adapter for VAG 1274B - VAG 1274/9-



#### Checking condition

- Engine under operating temperature.

#### Checking sequence



#### WARNING

- ◆ *Hot vapours may escape when the coolant reservoir is opened; cover it with a cloth and open carefully.*
- ◆ *Safety measures must be followed when working on the cooling system.*

- Remove coolant expansion tank lid.
- Install the Adaptor for VAG 1274 - VAG 1274/8- on the coolant tank.
- Attach the Connection terminal - V.A.G 1274 B/1- to the VAG 1274B adaptor - VAG 1274/8- .



- Connect the Connection terminal - V.A.G 1274 B/1- to the Engine cooling system analyzer - VAG 1274B- through the flexible connection tube.
- With the Engine cooling system analyzer - VAG 1274B- , generate a pressure of approx. 1.4 bar.



#### DANGER!

*Risk of burns! Before removing the Engine cooling system analyzer - VAG 1274B- from the VAG 1274 adaptor - VAG 1274/8- and the Connection terminal - V.A.G 1274 B/1- , eliminate all system pressure. Press the pressure relief valve in the Engine cooling system analyzer - VAG 1274B- , until the manometer reads »0«.*

If the pressure does not drop:

- Locate and eliminate the exhaust area in the engine compartment (upper engine part) and on the lower part of the vehicle (lower engine part).

Coolant tank flap - check safety valve

- Install the coolant tank flap -1- in the VAG 1274B adaptor - VAG 1274/9- -2-.
- Attach the Connection terminal - V.A.G 1274 B/1- to the VAG 1274B adaptor - VAG 1274/9- .
- Connect the Connection terminal - V.A.G 1274 B/1- to the Engine cooling system analyzer - VAG 1274- or Engine cooling system analyzer - VAG 1274B- through the flexible connection tube.
- With the manual pump of the Engine cooling system analyzer - VAG 1274- or Engine cooling system analyzer - VAG 1274B- , generate a pressure of up to 1.6 bar.

With a pressure of ➤ [Item 13 \(page 104\)](#) the safety valve must be opened.

The safety valve must not open.

If the safety valve opens beyond the specified time limit:

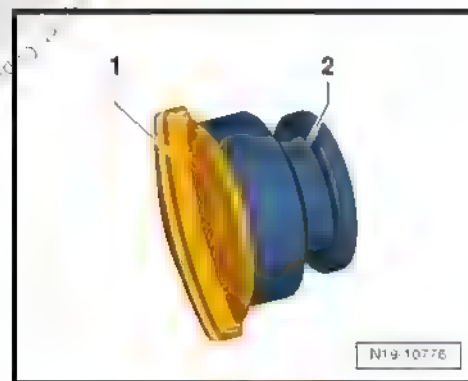
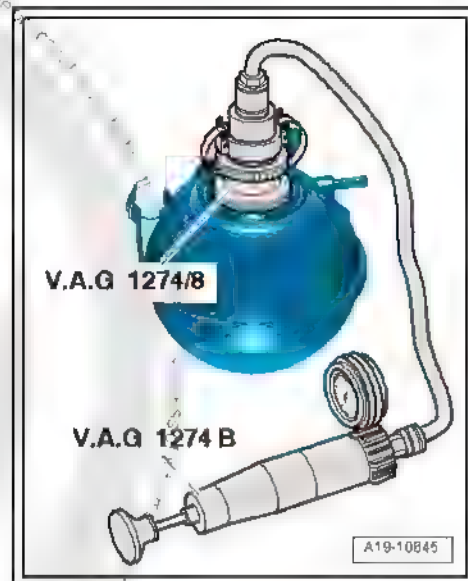
- Replace the coolant tank flap.
- Increase the pressure.

The safety valve must open after exceeding the indicated pressure.

If the safety valve does not open:

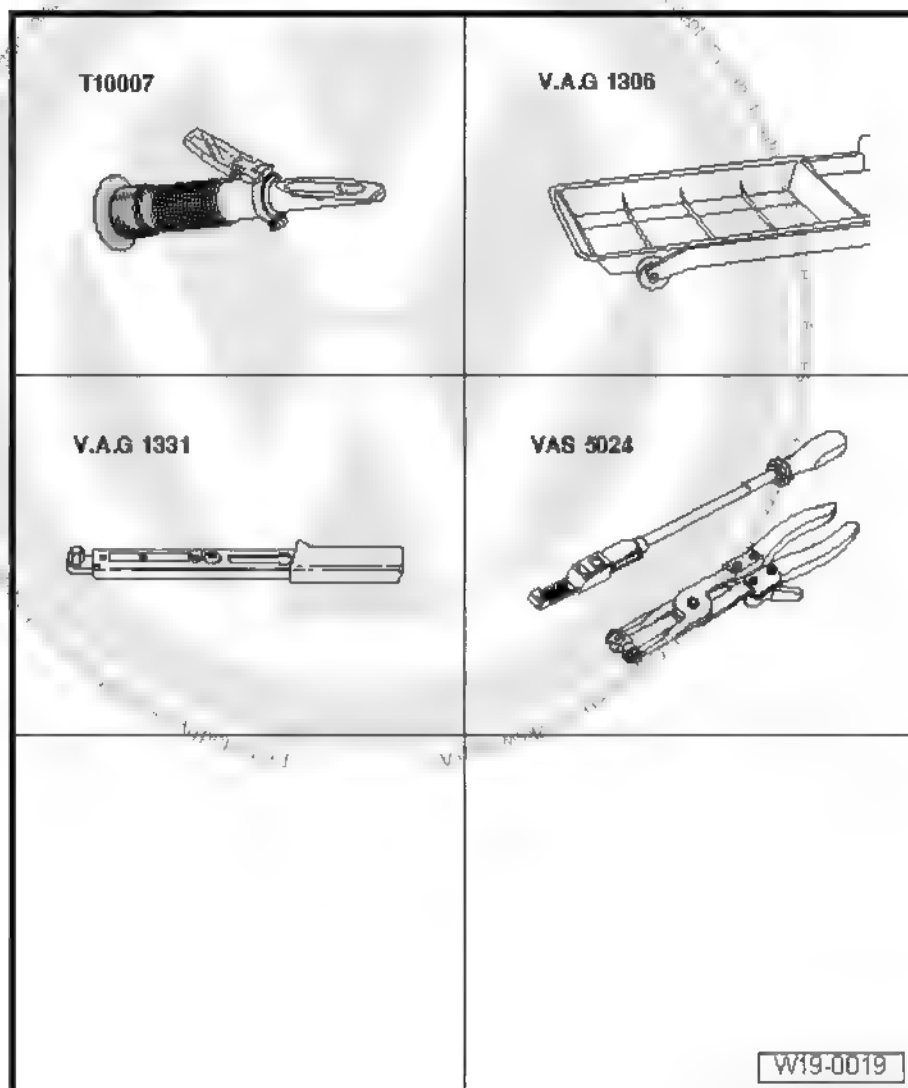
- Replace the coolant tank flap.

## 1.6 Radiator - remove and install





Special tools and workshop  
equipment required



- ◆ Refractometer - T10007A-
- ◆ Oil trap - VAG 1306-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-
- ◆ Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A-

### 1.6.1 Removal

- Remove bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumpers .
- Remove the lock carrier ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - Front section .
- Drain cooling system ⇒ [page 110](#) .
- Loosen quick couplings from the radiator cooling system hoses/clamps.
- Remove the radiator fan connector - V7- .
- Loosen the radiator fastening screws and remove the radiator with Radiator fan - V7- .



#### Vehicles with air conditioning

- Observe additional indications and installation works  
→ [page 121](#) .

### 1.6.2 Installation

Installation is carried out by inverting the removal sequence, observing the following:

- Replenish cooling system ⇒ [page 110](#) .
- Install front end ⇒ General body repairs, exterior; Rep. gr. 50 ; Body - Front section .
- Install bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumpers .

### 1.6.3 Additional notes and installation works in vehicles with air conditioning



#### WARNING

*The cooling gas circuit for the air conditioner should not be opened.*



#### Note

*To prevent faults in the cooling gas hoses and condenser, make sure the hoses are not stretched, bent or crushed.*

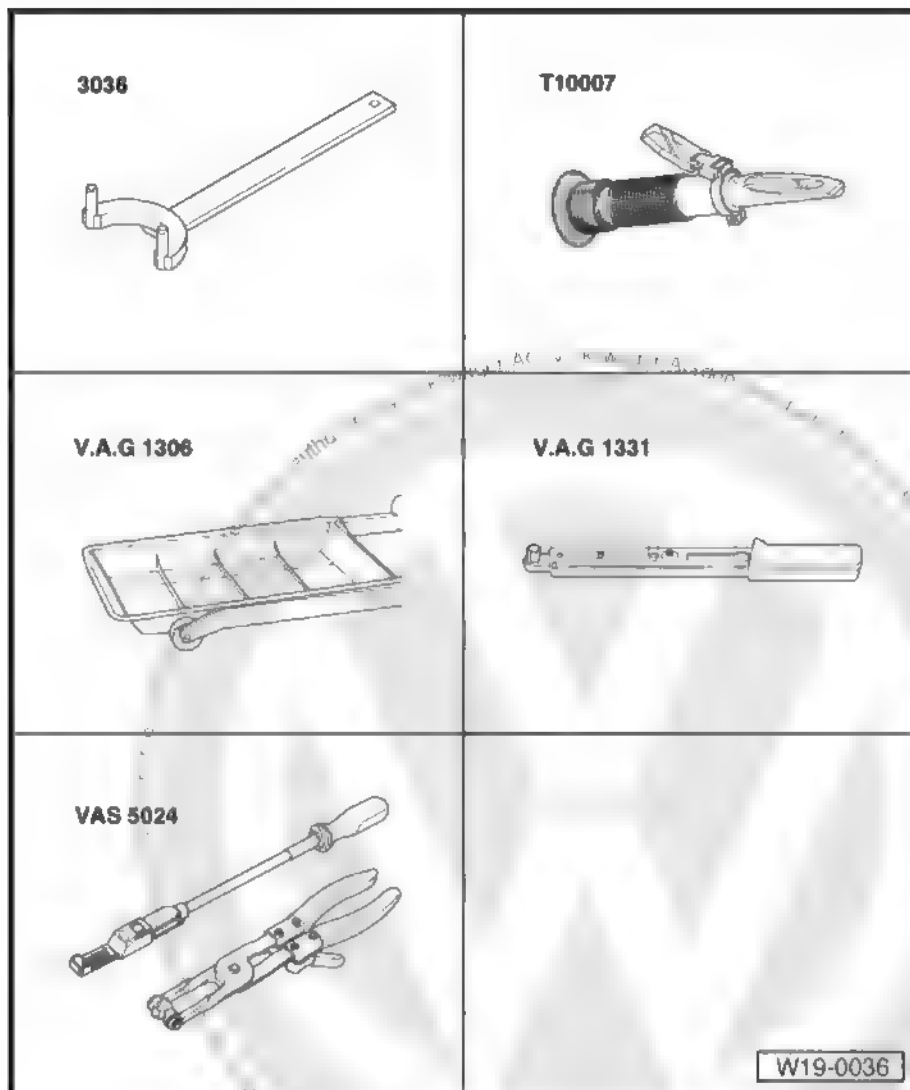
- Loosen cooling gas hose retaining clamp(s).
- Loosen radiator condenser and support it.

### 1.7 Water pump - remove and install





Special tools and workshop  
equipment required



- ◆ Pin wrench - 3036-
- ◆ Refractometer - T10007A- .
- ◆ Oil trap - VAG 1306-
- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-
- ◆ Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A- or Clamp pliers - VAG 1921-



Note

*Replace water pump seal if damaged.*

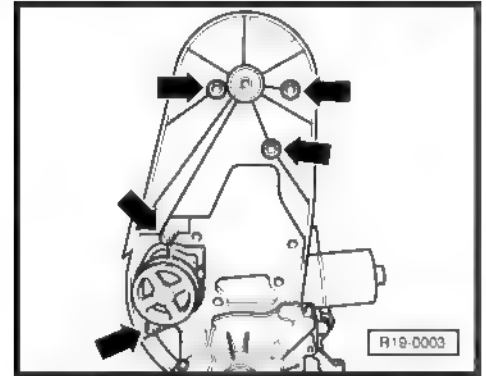
### 1.7.1 Removal

- Drain cooling system ➔ [page 110](#) .
- Remove toothed belt ➔ [page 59](#) .
- Remove the camshaft gear. To loosen the screw, immobilize the gear with a Special wrench - 3036- .





- Loosen fastening screws -arrows-from the water pump and mechanical distribution rear cover.
- Remove the water pump together with the engine block mechanical distribution rear cover .



### 1.7.2 Installation

Installation is carried out by in reverse order of the removal sequence, whilst observing the following:

- Install the water pump with the front cover of the mechanical distribution and tighten the lower fastening screws. Tightening torque: 20 Nm.
- Tighten the three upper fastening screws on the front cover of the mechanical distribution. Tightening torque: 10 Nm (install with Liquid sealant - D 000 600 A2- .
- Install the camshaft sprocket and tighten the new bolt (use the Special wrench - 3036- ). Tightening torque: 20 Nm + 90°.

Installing the toothed belt and adjusting distribution times  
⇒ [page 59](#) .

Refill the cooling system with new coolant ⇒ [page 110](#) .





## 20 – Fuel supply system

### 1 Fuel supply system components - removal and installation



#### Note

- ◆ *Hose connections are fitted by spring, pop top clamps, and, for the latter, always replace the lock when disconnected.*
- ◆ *To fasten the fuel hoses to the engine, use spring clamps only. Using tightening or screwed clamps is not allowed.*
- ◆ *To install spring clamps, we recommend using the Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A- or the Clamp pliers - VAG 1921-.*

Follow safety measures ⇒ [page 126](#) .

Follow cleaning rules ⇒ [page 127](#) .

Removal and installation of the fuel tank ⇒ [page 139](#) .

Removal and installation of accessories and the fuel filter in the fuel tank ⇒ [page 124](#) .

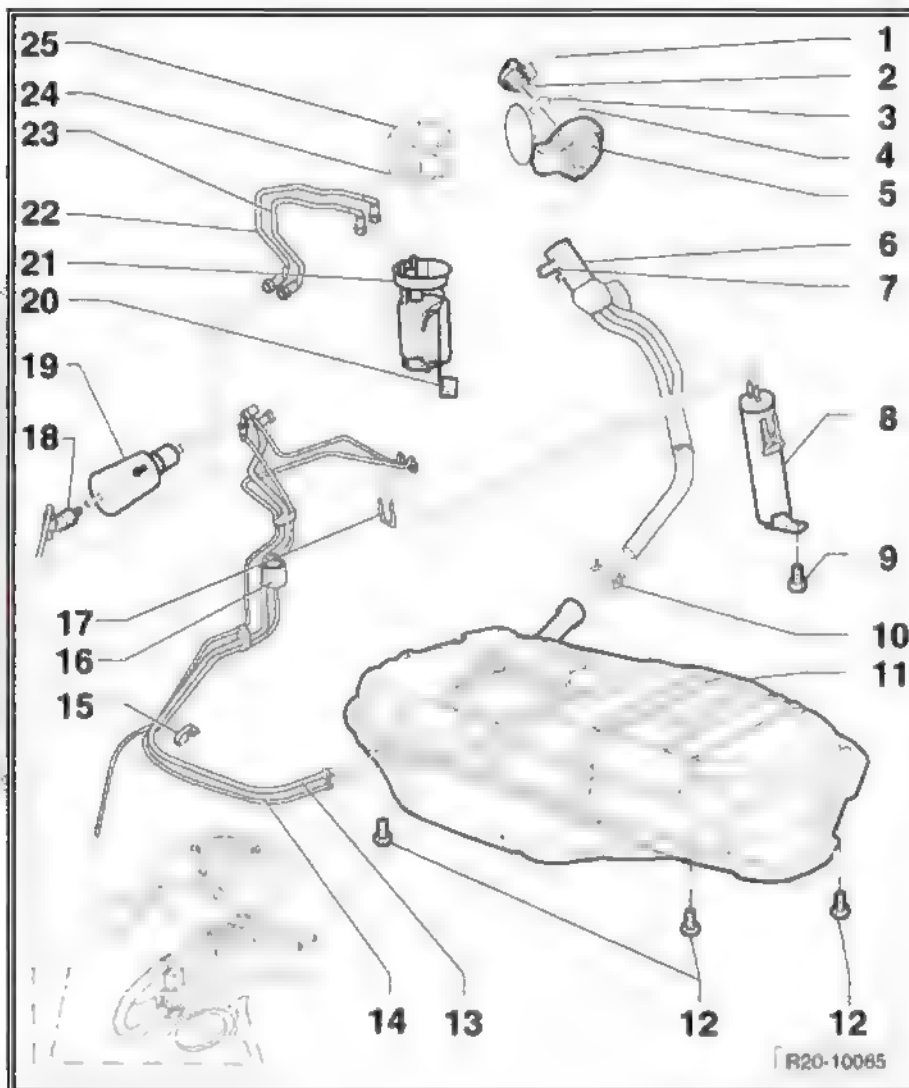
Repair engine power electronic adjustment parts (electric accelerator) ⇒ [page 150](#) .

Repair the activated charcoal filter system components ⇒ [page 152](#) .

#### 1.1 Fuel tank components with accessories and fuel filter - removal and installation



- 1 - Fastening clip
- 2 - Fuel tank cap
- 3 - Seal
  - ☐ Replace if damaged
- 4 - Fastening screw
- 5 - Fuel reservoir lid
  - ☐ With rubber boot.
  - ☐ Remove and install ⇒ General body assembly jobs, exterior; Rep. gr 55 ; Caps .
- 6 - Fuel supply line
- 7 - Vent valve
  - ☐ Check ⇒ [page 126](#)
- 8 - Activated charcoal filter
  - ☐ Installation location: in the right rear wheel case.
- 9 - 10 Nm
- 10 - Spring clamp
- 11 - Fuel reservoir
  - ☐ Remove using the Gearbox or engine + gearbox assembly jack or VAG 1383A - EQ 7081- .
  - ☐ Remove and install ⇒ [page 139](#) .
- 12 - 25 Nm
- 13 - Hose from the tank to the activated charcoal filter
- 14 - Hose from the tank to the gravitational valve
- 15 - Bearing
- 16 - Gravity valve
  - ☐ For removal, remove the cover of the right rear wheel housing.
  - ☐ Check valve passage continuity. Perpendicular valve: open. Valve inclined 45°: closed.
- 17 - Junction
- 18 - Quick coupling
- 19 - Fuel filter
  - ☐ Installation position: the arrow indicates the flow direction.
  - ☐ Pop Top quick coupling, replace lock when disconnected ⇒ [page 127](#)
- 20 - Fuel level indicator sensor - G-
  - ☐ Remove and install ⇒ [page 138](#) .
- 21 - Fuel pump (pre-supply pump) - G6-
  - ☐ Remove and install ⇒ [page 137](#) .
  - ☐ During pump removal, replace the sealing ring.
  - ☐ Clean screen filter, if dirty.
  - ☐ Check the Fuel system pressurisation pump - G6- ⇒ [page 141](#) .
  - ☐ Check the installation position in the fuel tank ⇒ [page 126](#)





## 22 - Supply tubes

- ☐ Black.
- ☐ Make sure it is well fastened
- ☐ For fuel distributor.

## 23 - Fuel return lines

- ☐ Blue
- ☐ Fastened laterally to the fuel reservoir.
- ☐ Make sure it is well fastened

## 24 - Support ring

## 25 - Circlip

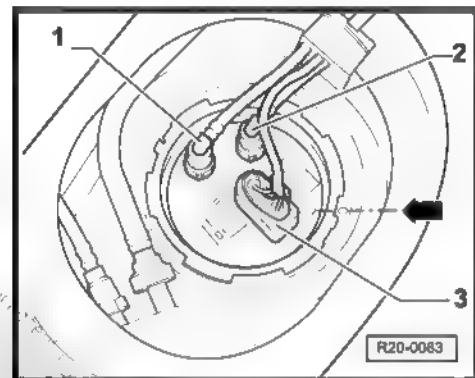
### Installation position for the Fuel pump (pre-supply pump) - G6-

The arrow on the Fuel pump (pre-supply pump) - G6- must match the yellow dot on the right side of the body.

Blue return lines -1- in the connection.

Supply lines -2- in the connection.

Electrical connector of the Fuel pump (pre-supply pump) - G6- -3-.



### Note

After installing the Fuel pump (pre-supply pump) - G6- check if inlet, return and vent pipes are still fastened to the fuel reservoir.

### Vent valve - check

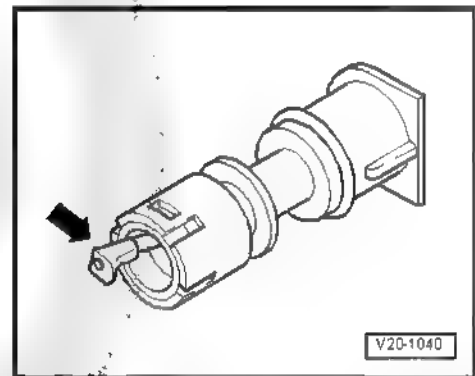
Lever in the resting position: closed.

Lever pushed in the -arrow -direction: open.



### Note

Before vent valve installation, remove fuel reservoir lid.



## 1.2 Safety measures regarding work on the fuel supply systems



### WARNING

Whilst working within the engine compartment in particular, due to the limited space available, take the following into account:

- ◆ All hoses (e.g. fuel, hydraulics, activated charcoal filter system, cooling system and cooling gas, brake fluid, vacuum) and electric cables must be restored to their original positions.
- ◆ Allow easy access to all the moving or hot parts.



While removing or installing the Fuel gauge sensor - G- or the Water pump (pre-supply pump) - G6- , when the fuel reservoir is full or partially full, observe the following



#### WARNING

*Fuel supply hose is under pressure. Wrap hose connections in cloth prior to loosening. Next, eliminate pressure by carefully removing hose*

- ◆ Before starting installation work, place the suction hose of a gas extraction device near the fuel tank opening in order to extract to absorb gases released by the fuel. If an extracting device is unavailable, use a radial fan (the engine must be out of air flow) with an air displacement rate greater than 15 m<sup>3</sup>/hour.
- ◆ Avoid skin contact with fuel! Wear fuel resistant gloves!
- ◆ For safety reasons, before opening the system, remove fuse number. 33 of the Fuel pump (pre-supply pump) - G6- .

### 1.3 Cleaning rules

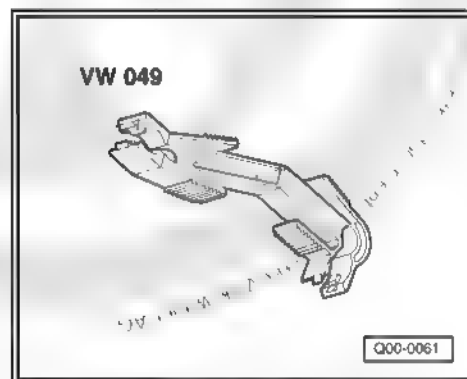
For cleaning, carefully observe these "5 rules" when working on the fuel supply/injection system:

- ◆ Thoroughly clean the connections and surrounding areas before disconnecting them.
- ◆ Place parts on clean surface and cover them. Use lint-free cloths!
- ◆ If the repair work will not be performed immediately, exposed components must be covered or carefully preserved.
- ◆ Install clean components only. Remove spare parts from packaging just prior to installation. Do not install components that have been stored outside of packaging (i.e. inside a tool box, etc.).
- ◆ With system open: Avoid using compressed air, if possible. Do not move vehicle, if possible.

### 1.4 Quick connection "Pop Top" - disconnection and connection

Special tools and workshop equipment required

- ◆ Wrench - VW 049-





#### WARNING

*Fuel in the supply line is kept under pressure; depressurize system before disconnecting hoses.*

### 1.4.1 Disconnect

- Place tool on connector.

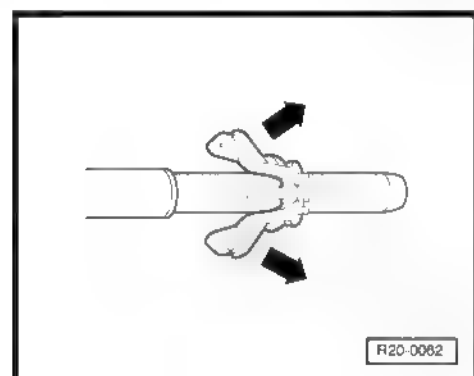
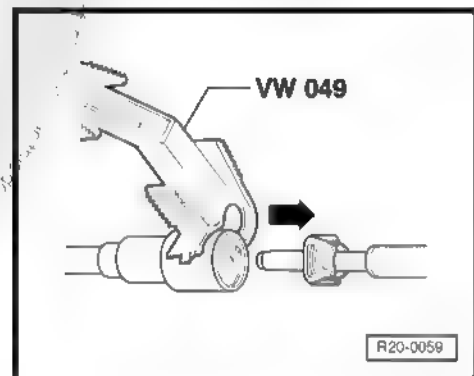
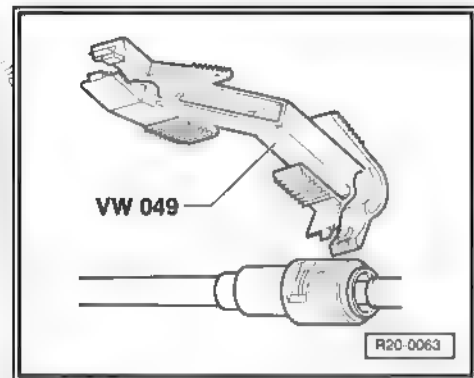
- Pull the connection body tube disconnecting it.

- To remove the lock, move it in the direction of the arrows.



#### Note

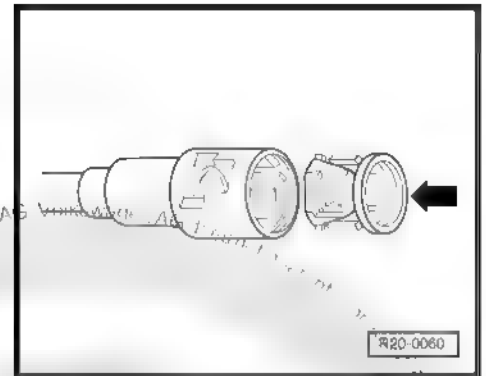
*Whenever a quick coupling is undone, the lock must be replaced.*





### 1.4.2 Connect

- Use a new lock, installing it onto the connector.

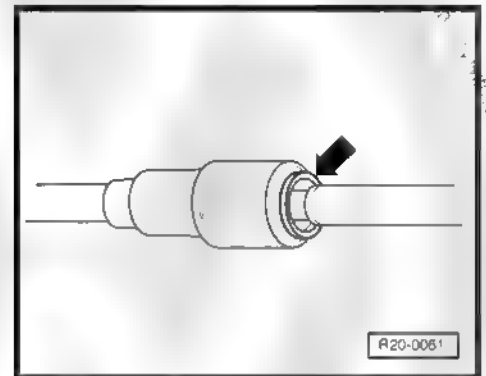


- Remake connection. The ring for checking the correct assembly is released from the lock when pulling the connector in the uncoupling direction.



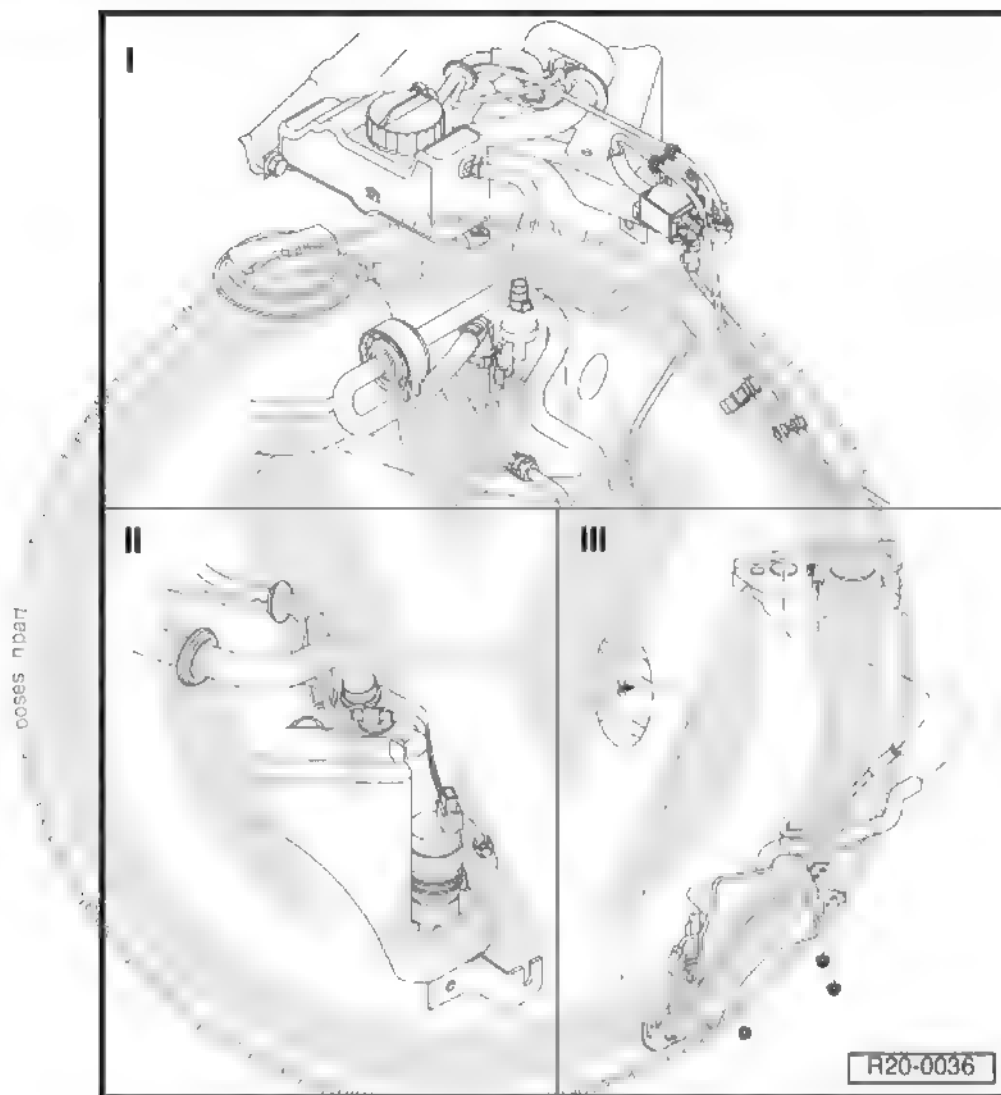
#### Note

*Make sure the quick coupling is totally engaged (install it until you hear a characteristic "click").*



### 1.5 Cold start system components - remove and install

BJE and BNX engines.



#### Note

- ◆ *Keep fuel tank always replenished regardless of the season of the year.*
- ◆ *The cold start system operates at ambient temperature of 20 °C or less.*

I ⇒ [page 131](#)

II ⇒ [page 132](#)

III ⇒ [page 133](#)





## 1.5.1 Part I

Engine compartment.

### 1 - Petrol supply reservoir

#### 2 - Hose

- ☐ For ventilating petrol reservoir.
- ☐ Hose fastening with deformable clamp
- ☐ Replace clamp and install using pliers Clamp pliers - VW 004V- or Clamp pliers - VAG 1275-.

#### 3 - Hose

- ☐ For replenishing petrol reservoir.

#### 4 - Cold start system gasoline tank

- ☐ For removal, remove right front and wheel case protector ⇒ General body repairs, exterior; Rep. gr. 66 ; External equipment .

#### 5 - Supply tubes

- ☐ To the Cold start valve - N17- .

#### 6 - Venting tubes

- ☐ To the air filter.

#### 7 - Supply tubes

- ☐ To Throttle valve control unit - J338- .

#### 8 - Cold start valve - N17-

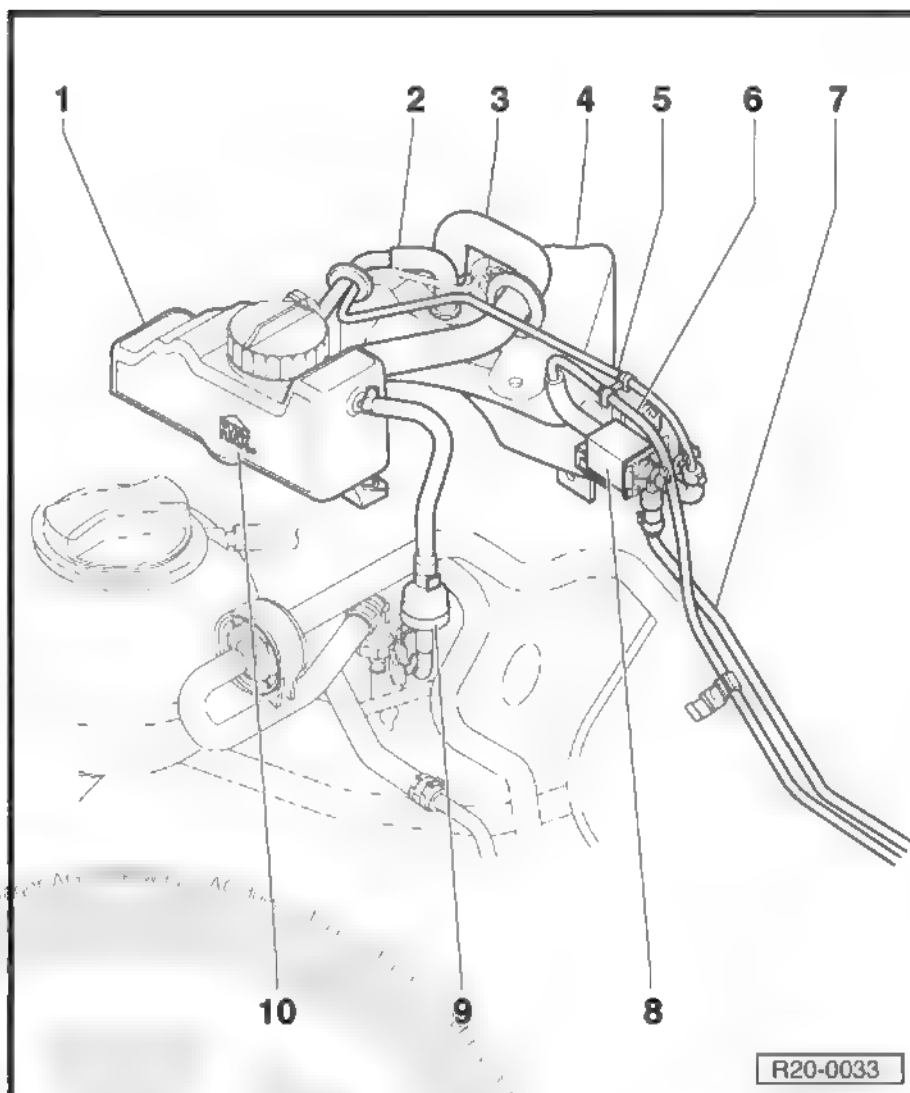
- ☐ With 3-ways.
- ☐ Union nuts torque: 4 Nm.

#### 9 - Ventilation valve

- ☐ Unidirectional.
- ☐ To activated charcoal filter.
- ☐ Blue pipes.

#### 10 - Maximum fuel level

- ☐ Do not exceed maximum indication limit.





## 1.5.2 Part II

Front right wheel case.

### 1 - Eyelet

- ☐ Use neutral soap for easier installation.

### 2 - Hose

- ☐ For ventilating petrol reservoir
- ☐ Hose fastening with deformable clamp.
- ☐ Replace clamp and install using pliers Clamp pliers - VW 004V- or Clamp pliers - VAG 1275-.

### 3 - Hose

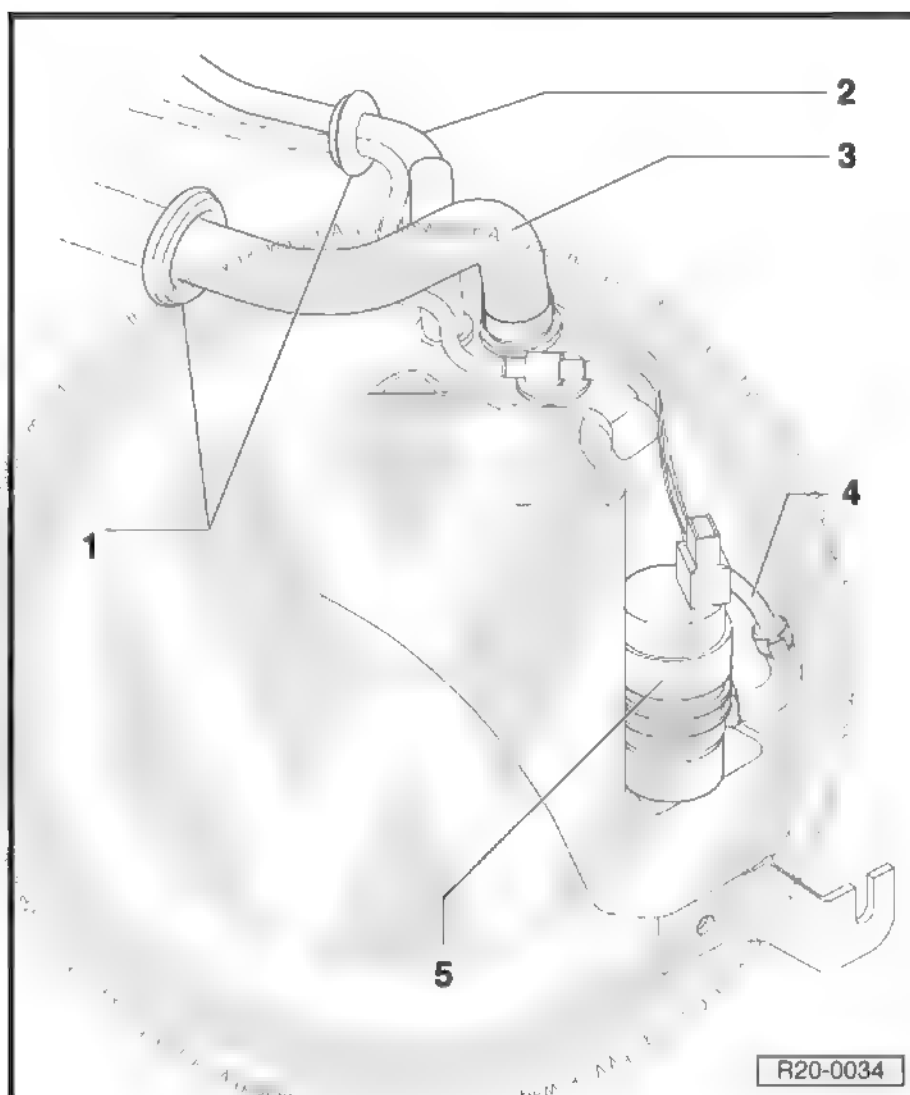
- ☐ For replenishing the fuel tank.

### 4 - Lines

- ☐ For the supply.
- ☐ Of the Cold start fuel pump - V263- for the Cold start valve - N17-.

### 5 - Fuel pump for cold start V263-

- ☐ To remove, disengage from tank.





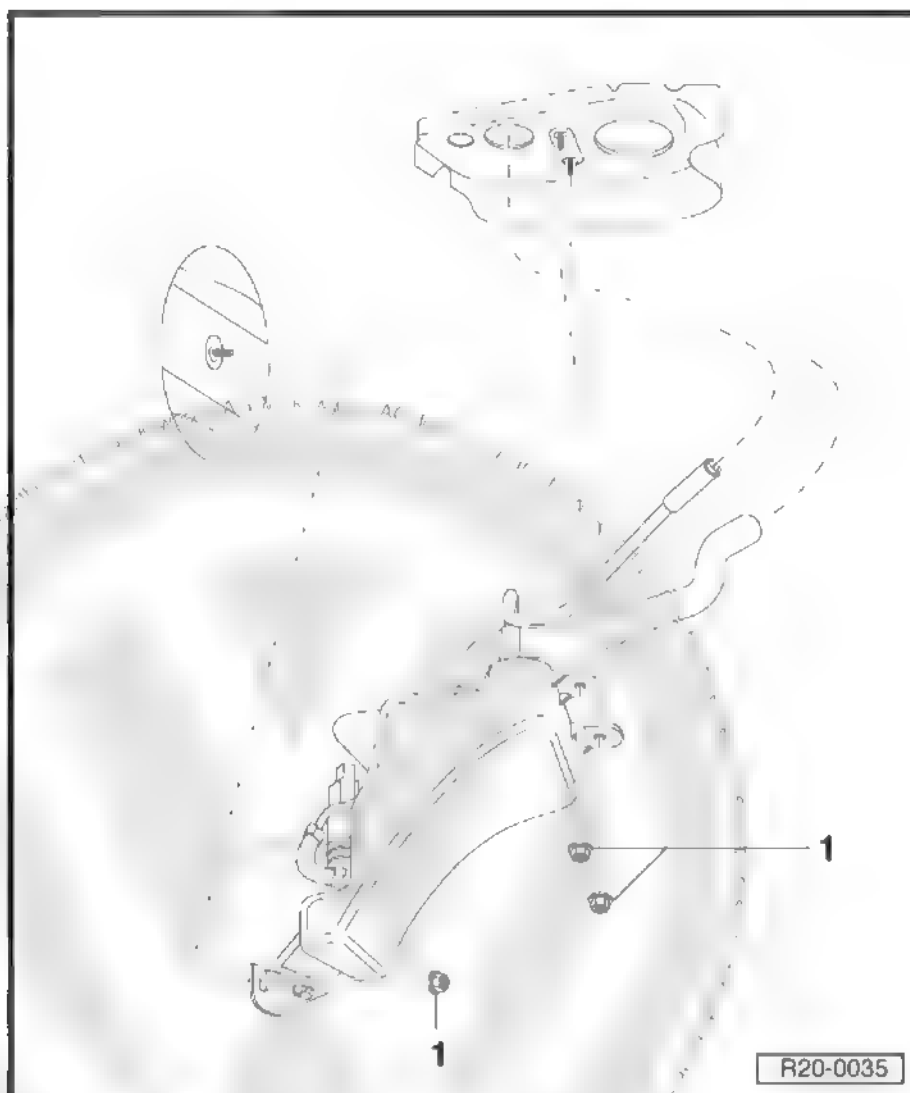
### 1.5.3 Part III

Right front wheel case (petrol reservoir fastening).

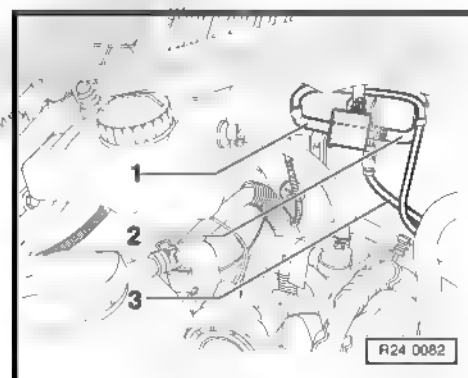
1 - 4 Nm

- ❑ When installing the reservoir, the hoses and the Fuel pump for cold start - V263- must be installed

2 - 2 Nm



- Positioning of hoses in the Cold start valve - N17- : -1- Ventilation hose -2- Hose for Fuel pump for cold start - V263- in petrol reservoir -3- Hose for Cold start valve - N17- until intake manifold.





## 1.5.4 Cold start system components - remove and install

CCNA Engine

### 1 - Gasoline tank

### 2 - Hose

- ☐ For ventilation.
- ☐ Hose fastening with de-formable clamp
- ☐ Replace clamp and in-stall using pliers Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- .

### 3 - Supply hose

- ☐ For Cold start fuel pump - V263- for Cold start valve - N17- .
- ☐ Hose fastening with de-formable clamp.
- ☐ Replace clamp and in-stall using pliers Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- .

### 4 - Fuel pump for cold start - V263-

- ☐ To remove, disengage from tank.

### 5 - Cold start valve - N17-

- ☐ With 3-ways.
- ☐ Union nuts torque: 4 Nm.

### 6 - Hose

- ☐ Aeration, to the air filter.
- ☐ Hose fastening with de-formable clamp.

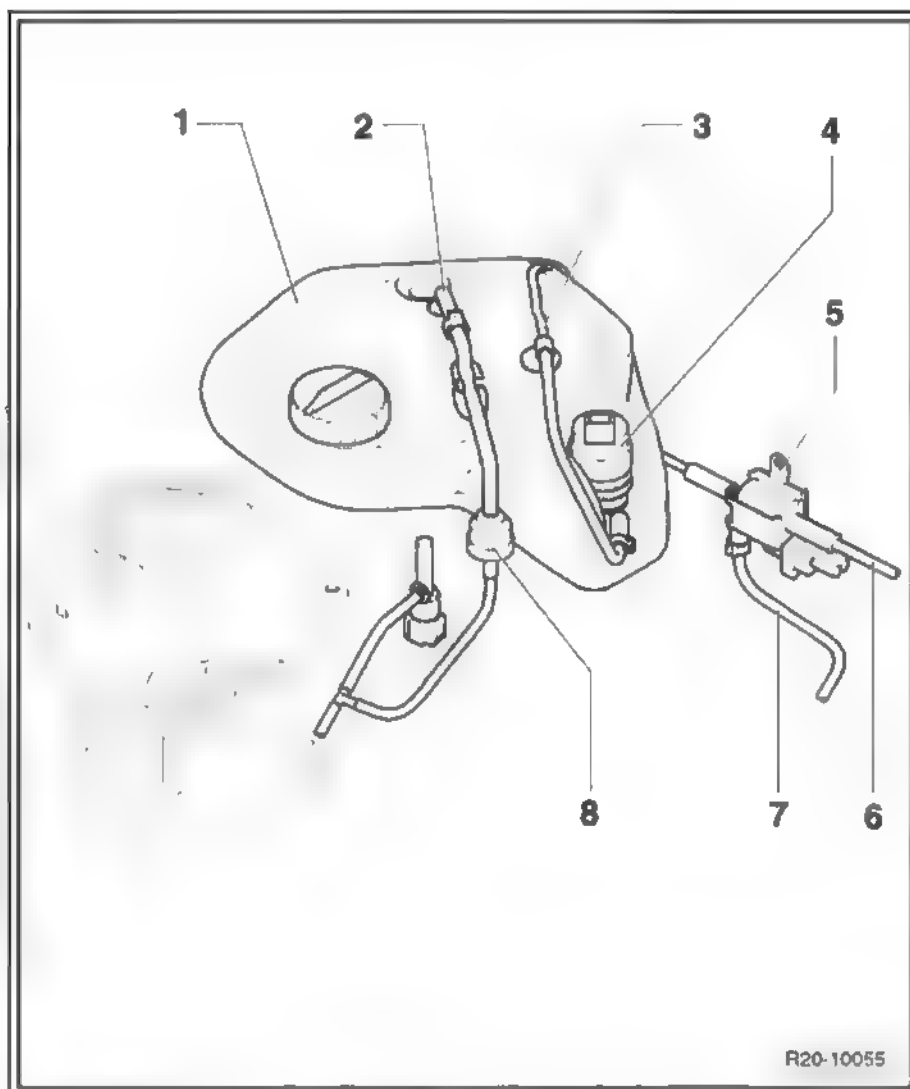
- ☐ Replace clamp and install using pliers Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- .

### 7 - Hose

- ☐ Supply, to the Throttle valve drive - J338- .
- ☐ Hose fastening with de-formable clamp.
- ☐ Replace clamp and install using pliers Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- .

### 8 - Ventilation valve

- ☐ Unidirectional
- ☐ To activated charcoal filter
- ☐ Blue pipes





## 1.5.5 Cold start system components - remove and install

### CPBA Engine

#### 1 - Gasoline tank

- ☐ Fastening screw torque:  
4 Nm.

#### 2 - Hose

- ☐ To activated charcoal filter
- ☐ Hose fastening with deformable clamp.
- ☐ Replace clamp and install using Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- or Clamp pliers - VAG 1275A- .

#### 3 - Hose

- ☐ For ventilation.
- ☐ Hose fastening with deformable clamp.
- ☐ Replace clamp and install using Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- or Clamp pliers - VAG 1275A- .

#### 4 - 4 Nm

#### 5 - Bearing

#### 6 - Fuel pump for cold start - V263-

- ☐ Mounting nuts of the support have a torque of 4.0 Nm.

#### 7 - Hose

- ☐ For the supply.
- ☐ From the Fuel pump for cold start - V263- to the fuel filter.
- ☐ Hose fastening with deformable clamp.
- ☐ Replace clamp and install using Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- or Clamp pliers - VAG 1275A- .

#### 8 - Hose

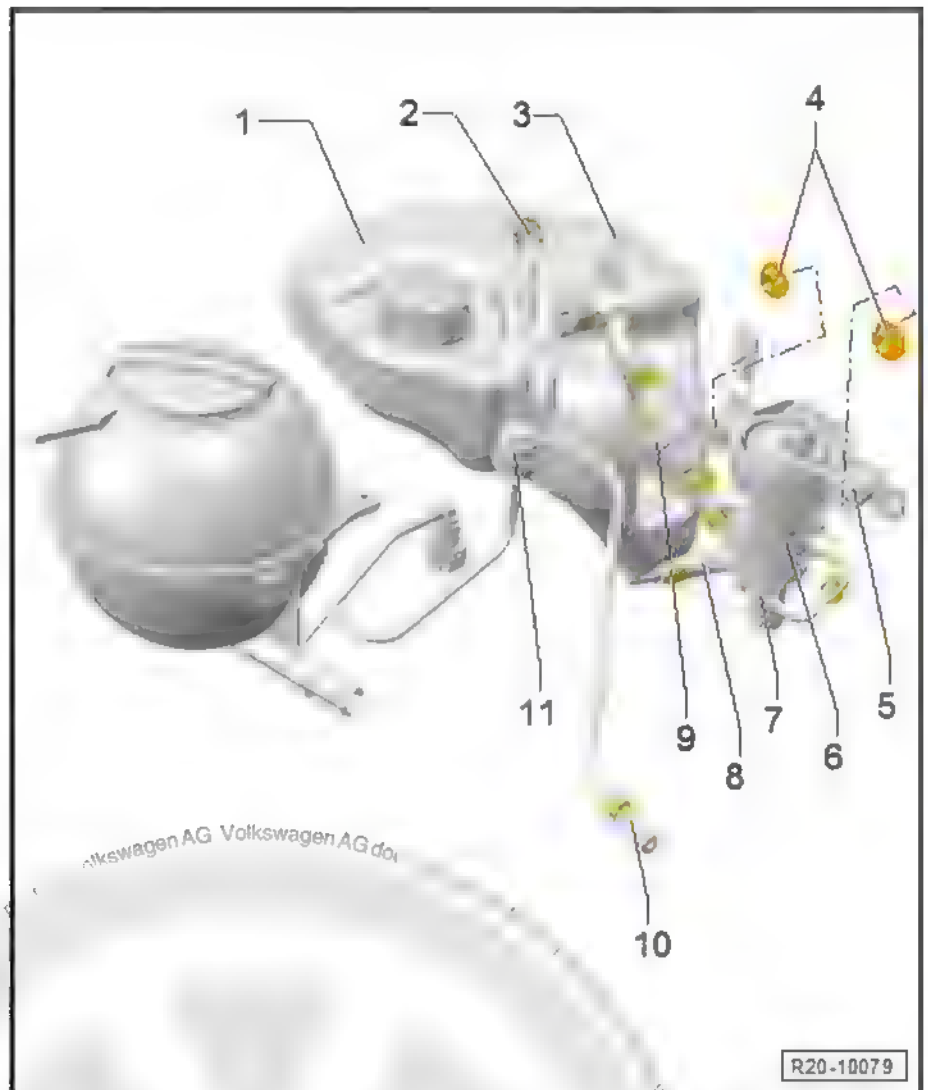
- ☐ For the supply.
- ☐ From the petrol reservoir to the Fuel pump for cold start - V263- .
- ☐ Hose fastening with deformable clamp.
- ☐ Replace clamp and install using Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- or Clamp pliers - VAG 1275A- .

#### 9 - Fuel filter

- ☐ Fastened with deformable clamp.
- ☐ Replace clamp and install using Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- or Clamp pliers - VAG 1275A- .

#### 10 - Hose

- ☐ For the supply.
- ☐ From the fuel filter to the Cold start valve - N17- .





- ☐ Hose fastening with deformable clamp.
- ☐ Replace clamp and install using Clamp pliers - VW 004V- or Clamp pliers - VAG 1275- or Clamp pliers - VAG 1275A- .

#### 11 - Ventilation valve

- ☐ Unidirectional.
- ☐ To activated charcoal filter.

### Fuel distributor - cold start system

#### CPBA Engine

#### 1 - Cold start valve

#### 2 - Connector circlip

- ☐ To remove, move the circlip in the direction of the -arrow- and remove the connection.
- ☐ During installation, the connection will be locked when the circlip is compressed downwards and a characteristic clicking sound is audible.

#### 3 - 4 Nm

#### 4 - Cold start system fuel distributor

#### 5 - Injector

- ☐ To remove, move the side lock bearing.

#### 6 - Seal

- ☐ Replace when the injector is removed from the fuel distributor.
- ☐ Replace when the fuel distributor is removed from the intake collector.
- ☐ During installation, lubricate with clean engine oil.

#### 7 - 25 Nm

#### 8 - Connector

- ☐ Black, 6 poles.
- ☐ For Throttle valve control unit - J338- .
- ☐ Gold plated connector contacts.

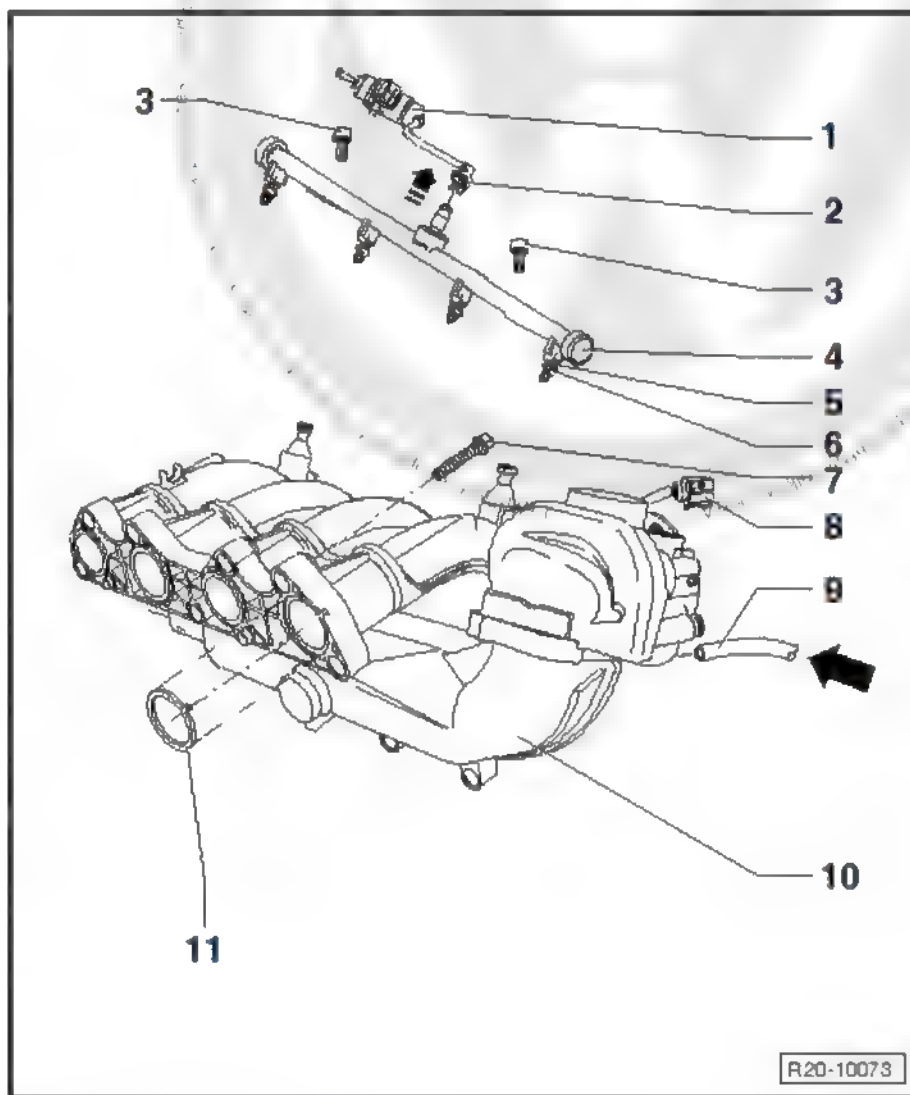
#### 9 - For Magnetic valve I for the activated charcoal tank - N80-

- ☐ Fasten with spring braces

#### 10 - Intake manifold

#### 11 - Seal

- ☐ Replace
- ☐ Check installation position.





#### Note

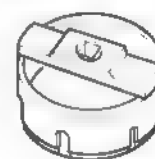
- ◆ *Keep fuel tank always replenished regardless of the season of the year.*
- ◆ *The cold start system operates at ambient temperatures lower than or equal to 18 °C*

### 1.6 Fuel pump (pre-supply pump) - G6- - remove and install

Special tools and workshop equipment required

- ◆ Wrench - VW 5321/9- or Wrench - T10334-

VW 5321/9



Q00-0016

- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-

V.A.G 1332



W00-11165

#### 1.6.1 Removal

- Take safety precautions before starting removal ⇒ [page 126](#) .
- Follow cleaning rules ⇒ [page 127](#) .
- Check if the vehicle has code radio; if so, request respective anti-theft code
- With the ignition off, disconnect the earth wire from the Battery - A- .
- Fold rear seat forward.
- Remove the Fuel pump (pre-supply pump) - G6- access cover.



#### WARNING

*Fuel supply hose is under pressure. Wrap hose connections in cloth prior to loosening. Next, eliminate pressure by carefully removing hose.*

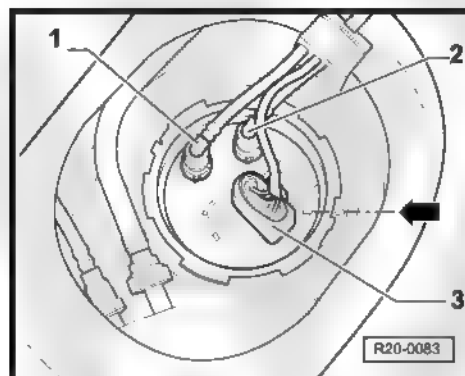


- Remove the return -1- and supply -2- lines and the connector -3- from the Fuel pump (pre-supply pump) - G6-



#### Note

To remove fuel hoses, press the safety key located under the connection.

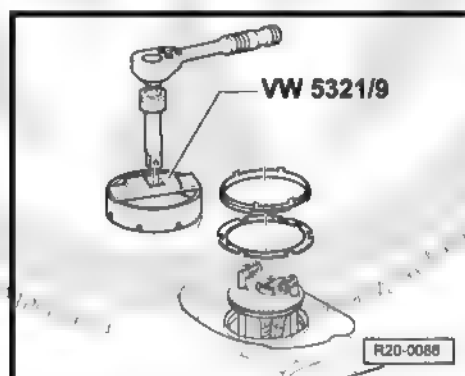


- Remove the lock with a Wrench - VW 5321/9- or Wrench - T10334- .
- Remove the Fuel pump (pre-supply pump) - G6- and the seal from the opening in the fuel tank.



#### Note

In case of replacing Fuel pump (pre-supply pump) - G6- , empty the old Fuel pump (pre-supply pump) - G6- before disposing it.



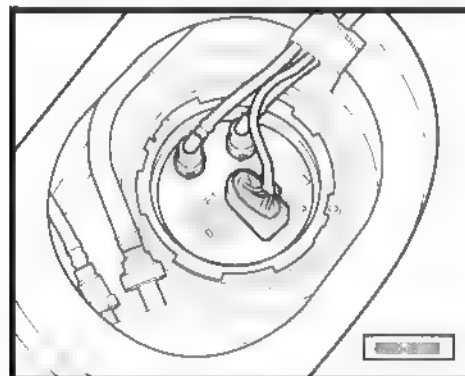
## 1.6.2 Installation

- The Fuel pump (pre-supply pump) - G6- should be installed in reverse order of removal.



#### Note

- ◆ Try not to bend the Fuel gauge sensor - G- during installation.
- ◆ Put the new sealing ring of Fuel pump (pre-supply pump) - G6- in dry condition on fuel reservoir opening.
- ◆ Lubricate the new sealing ring with fuel only for installing the Fuel pump (pre-supply pump) - G6- .
- ◆ Observe installation position of the Fuel pump (pre-supply pump) flange - G6- -arrow-. The mark on the Fuel pump (pre-supply pump) - G6- shall match that on the body.
- ◆ Check that the fuel hoses are firmly connected.
- ◆ Do not confuse the supply and return hoses.
- ◆ After installation of the Fuel pump (pre-supply pump) - G6- , check whether the supply, return and vent pipes are still fastened to the fuel reservoir.



## 1.7 Fuel gauge sensor - G- - remove and install

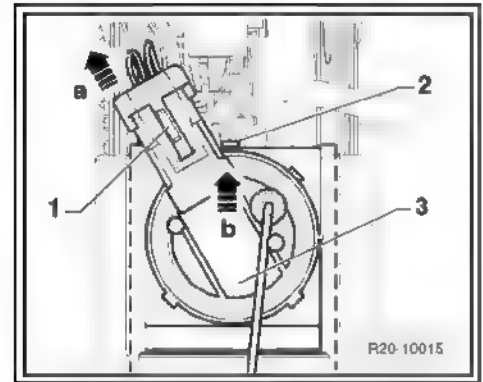
### 1.7.1 Removal

- Remove Fuel pump (pre-supply pump) - G6- ➤ [page 137](#) .
- Disconnect the connector from the Fuel gauge sensor - G- by displacing the lock -1- and moving it towards -arrow a-.





- Press lock -2- and move the Fuel gauge sender - G- -3- upwards -arrow b-.



### 1.7.2 Installation

- Position the Fuel gauge sensor - G- in the Fuel pump (pre-supply pump) guides - G6- and press downwards until it fits.
- Install the Fuel gauge sensor connector - G- .

### 1.8 Fuel reservoir - remove and install

Special tools and workshop equipment required

- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-

V.A.G 1331



W00-11166

- ◆ Gearbox or engine + gearbox assembly jack - EQ 7081- or Gearbox or engine + gearbox assembly jack - VAG 1383A-

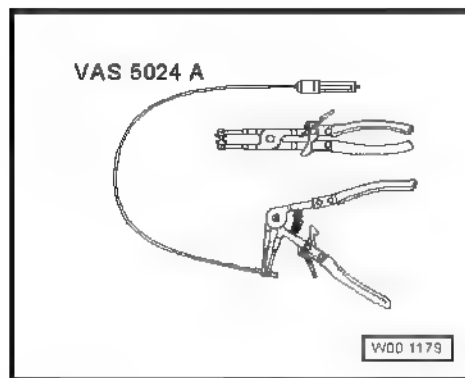
V.A.G 1383 A



W00-11135



- ◆ Standard-type clamp pliers - VW 5162 (VWB) - ou - VAS 5024A-



## 1.8.1 Removal

### Conditions

- The fuel tank must only be half full.



### Note

- ◆ *Empty the fuel tank with a Fuel aspirator and tank - VAS 5190- .*
- ◆ *Take safety precautions before starting removal, [page 126](#) .*
- Check if the vehicle has code radio; if so, request respective anti-theft code.
- With ignition off, disconnect earth wire from the Battery - A- .
- Remove fuel reservoir lid.
- Empty the fuel tank and clean around the filling nozzle.
- Fold rear seat forward.
- Remove the Fuel pump (pre-supply pump) - G6- access cover.
- Disengage the 4-poles connector from Fuel pump (pre-supply pump) - G6- .
- Remove the fuel tank hoses near the Fuel pump (pre-supply pump) - G6- .
- Loosen exhaust system. The exhaust system must be fastened to the body with wire, slightly lowered.
- Remove the heat deflector between the exhaust and the fuel tank.

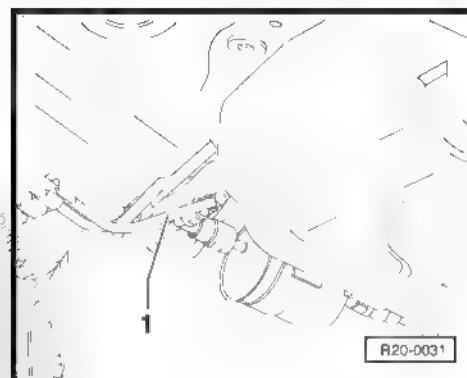


- Loosen supply hose 1 from the filter
- Remove the supply line clamp next to the reservoir with VAS 5024A or Standard-type clamp pliers - VW 5162- or Pliers - VAG 1921-.
- Remove fastening bolts, supporting the fuel tank with the Engine / gearbox jack - EQ 7081- or Engine / gearbox jack - VAG 1383A-.
- Lower the fuel tank.



#### WARNING

*Fuel supply hose is under pressure. Wrap hose connections in cloth prior to loosening. Next, eliminate pressure by carefully removing hose*



### 1.8.2 Installation

Installation is carried out in reverse order of removal, whilst considering the following:

- ◆ Attach the ventilation and fuel hoses without bending them.
- ◆ Check that the fuel hoses are firmly connected.



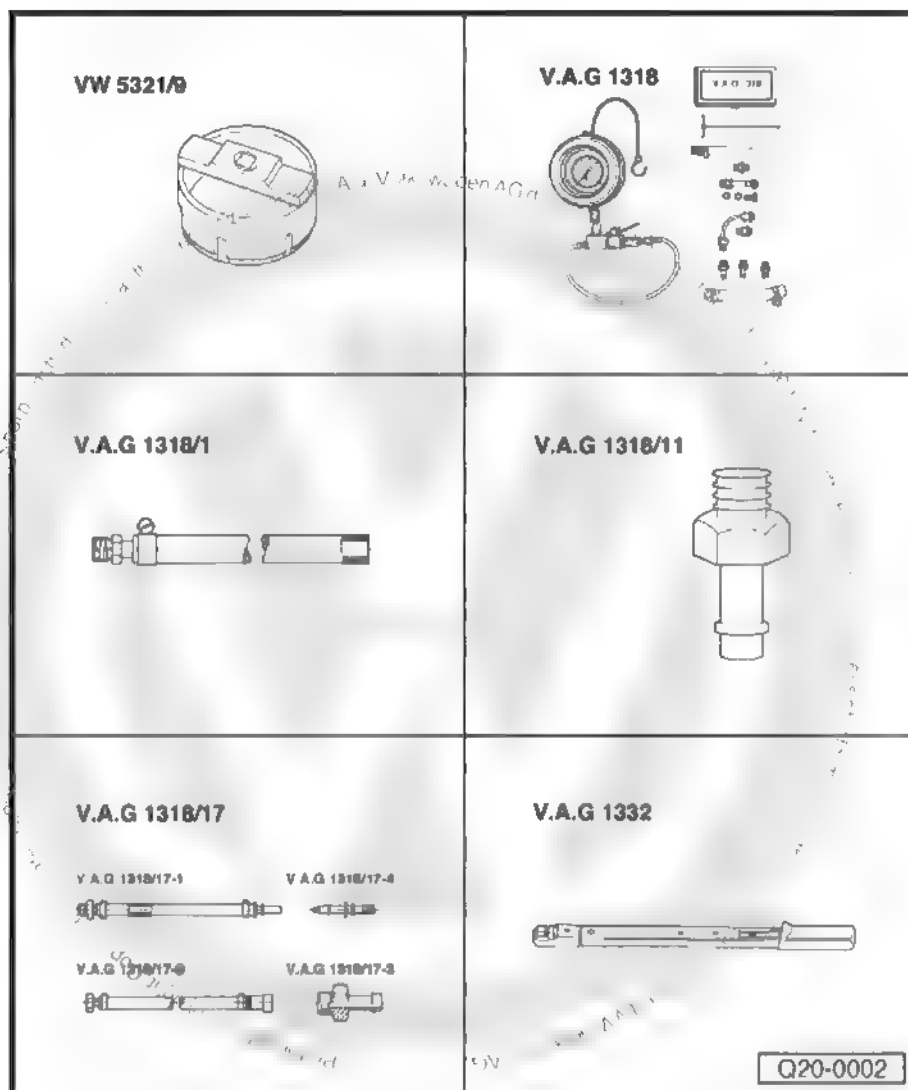
#### Note

*Once the fuel tank is installed, check that the supply, return and ventilation hose assemblies are still attached.*

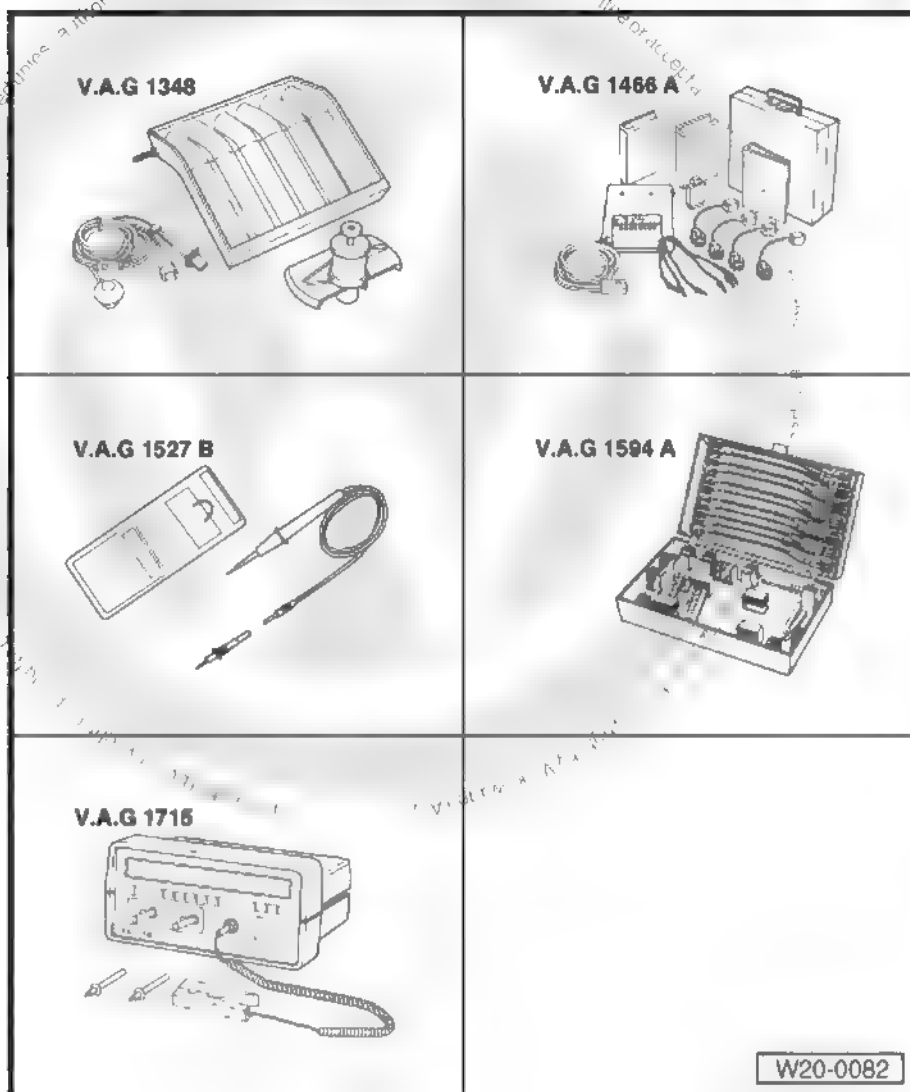
### 1.9 Fuel pump (pre-supply pump) - G6- - check



Special tools and workshop  
equipment required



- ◆ Wrench or T 10334 - VW 5321/9-
- ◆ Pressure gauge - VAG 1318-
- ◆ Adapter - VAG 1318/1-
- ◆ Adapter - VAG 1318/11-
- ◆ Adapter - VAG 1318/17-
- ◆ Torque Wrench - 40 to 200 Nm ( 1/2" drive) - VAG 1332-
- ◆ Flow meter - VAG 1348-
- ◆ Adapter - VAG 1318/98-

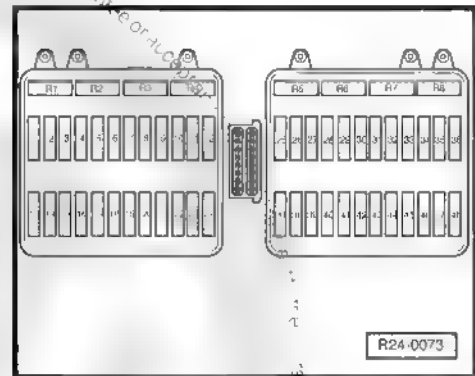


- ◆ Control system for relay-controlled circuits - VAG 1466A-
- ◆ Test probe - EQ 7300- or Test probe - VAG 1527B-
- ◆ Auxiliary measurement cable set - VAG 1594A- ou Auxiliary measurement cable set - VAG 1594C-
- ◆ Auxiliary measuring cable set - VAG 1594C-
- ◆ Multimeter - VAG 1715-
- ◆ Graduated container
- ◆ ⇒ Current flow diagrams, Electrical fault finding and Fitting locations



#### Check conditions

- Fuse number 33, OK.
- Battery - A- voltage of at least 11,5 V.
- All power consuming devices, like lights and rear window heater, must be off.
- If the vehicle is equipped with air conditioning, it should also be off



### 1.9.1 Operation of the electrical supply - check



#### Note

*In the following operations sequence, it may be possibly necessary to disconnect the Battery - A- earth wire. Therefore, check if a code radio is installed. Should that be the case, first obtain the anti-theft code.*

- Tilt rear seat forwards.
- Remove the cover beneath the seat.
- Turn the ignition system on. The Fuel pump (pre-supply pump) - G6- must operate in an audible way for approx. 1 second.

If the Fuel pump (pre-supply pump) - G6- does not work:

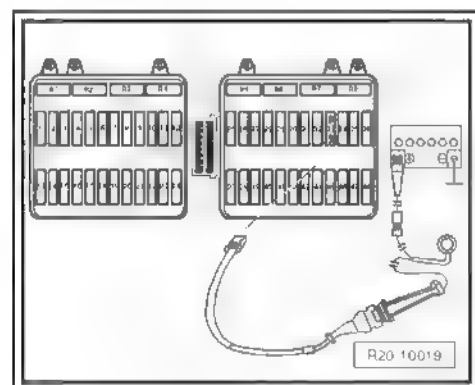
- Turn the ignition off.
- Remove the fuse box lid.
- Remove fuse 33 from the ( Fuel pump (pre-supply pump) - G6- ) fuse box.
- Connect the Remote control - VAG 1348/3A- and Adapter cable - VAG 1348/3-3- to the lower contact of fuse 33 (33b position) of the fuel system pressurisation pump - G6- activation and to the positive terminal of the Battery - A- (+).
- Activate the Remote control - VAG 1348/3A- .

If the Fuel pump (pre-supply pump) - G6- works:

- Check the activation of Fuel pump (pre-supply pump) - J17 - relay according to the ⇒ Current flow diagrams, Electrical fault finding and Fitting locations using the Control system for relay-controlled current circuits - VAG 1466A - :

If the Fuel pump (pre-supply pump) - G6- does not work:

- Disengage the 4-pole terminal connector from Fuel pump (pre-supply pump) - G6 - .





- Connect the Test probe - EQ 7300- or Test probe - VAG 1527B- with Auxiliary measurement cable set - VAG 1594A - or Auxiliary measurement cable set - VAG 1594C- to connector external contacts -1 and 4-.

- Activate the Remote control - VAG 1348/3A- . The LED should light up.

If the LED does not light up:

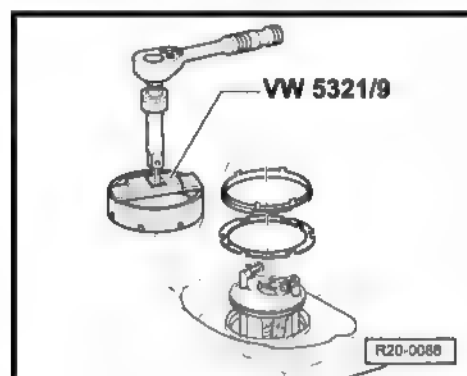
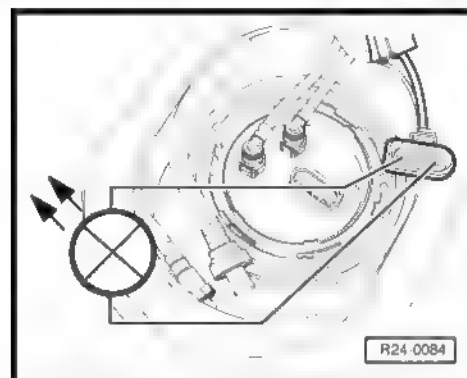
- Locate and eliminate cable interruption, according to⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

The LED lights up (correct power supply):

- Remove the Fuel pump (pre-supply pump) - G6- with a Wrench or T 10334 - VW 5321/9- .
- Check that the cables are coupled to the Fuel pump (pre-supply pump) - G6- .

If there is no cable interruption:

- Fuel pump (pre-supply pump) - G6- - damaged, replace ⇒ [page 137](#) .



## 1.9.2 Fuel flow - check

Check conditions

- The Fuel pump (pre-supply pump) - G6- supply does not display any irregularities.
- Remote control - VAG 1348/3A- , connected.
- Fuel pressure regulator and Fuel pump (pre-supply pump) pressure in order ⇒ [page 176](#) .

Checking process

- Remove fuel filling nozzle cap.



Note

*The flow of fuel is measured with pressure from the Fuel pump (pre-supply pump) in (Engine BJE/AQZ, 3.5 bar) (Engine BNX/CCNA/CPBA, 4.2 bar). For this reason fuel pressure must be checked before measuring the flow.*

- Remove fuel filling nozzle cap.

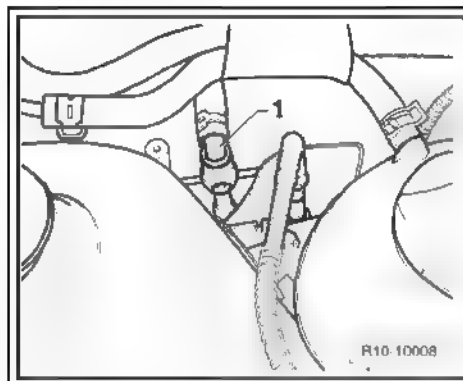


**WARNING**

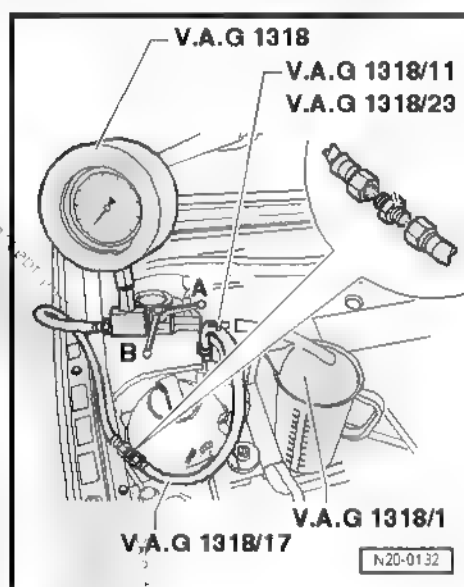
*Fuel supply hoses are under pressure. Wrap hose connection with cloth prior to loosening. Next, eliminate pressure by carefully disconnecting the hose.*



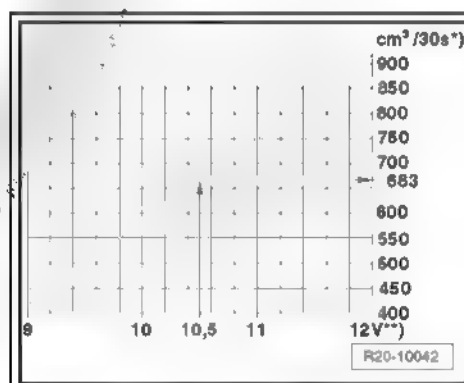
- Disconnect the fuel supply hose connection -1- and clean the spilled fuel with a cloth.
- Couple the Pressure gauge - VAG 1318- to the fuel supply tube, using the adaptors Connector - VAG 1318/23- and Adaptor - VAG 1318/17- .



- Connect the Pressure gauge - VAG 1318- hose to the Adapter - VAG 1318/11- and the Adapter - VAG 1318/1- of the Pressure gauge - VAG 1318- and place its end inside a graduated container with minimum capacity of 3.0 litres.
- Open the Pressure gauge Valve - VAG 1318- . It will indicate the flow direction -A-.
- Actuate the Remote control - VAG 1348/3A- , close the valve slowly until the Pressure gauge - VAG 1318- indicates positive pressure (of 3.5 Bar for BJE/AQZ Engine) (of 4.2 Bar for BNX/CCNA/CPBA Engine). From this moment on, do not change the position of the valve.
- Empty measuring container.
- The flow of the Fuel system pressurisation pump - G6- depends on the Battery voltage - A- . Accordingly, connect a Multimeter - VAG 1715- to the Battery - A- of the vehicle using the Auxiliary measurement cable set - VAG 1594A- or Auxiliary measurement set - VAG 1594C- .
- Activate the Remote control - VAG 1348/3A- for 30 seconds, measuring the Battery - A- voltage.
- Compare the fuel flow with the theoretical value.



For AQZ, BNX, CCNA, CPBA engines







## BJE engine

8) Minimum amount  $\text{cm}^3/30 \text{ s}$

9) Voltage in the Fuel system pressurisation pump - G6- with engine stopped and Fuel system pressurisation pump - G6- operating (approx. 2 volts less than the Battery voltage - A- ).

### Examples of readings

During the test, a voltage of 12.5 volts is measured on the Battery - A- . As with the Fuel pump - G6- voltage is approximately 2 volts lower than at the Battery - A- , the result is a minimal supply flow of:

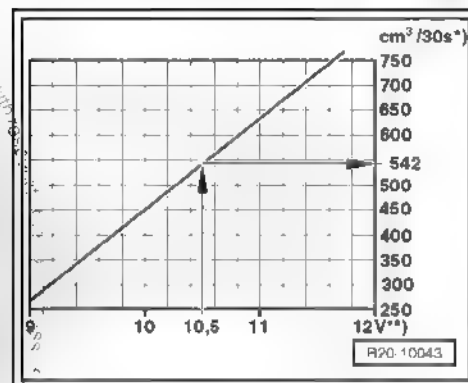
- ◆ 683  $\text{cm}^3/30 \text{ s}$ . For AQZ, BNX, CCNA, CPBA engines
- ◆ 542  $\text{cm}^3/30 \text{ s}$ . For BJE engine

If minimum flow is not achieved:

- Check if the supply pipes to the filter present folds or obstructions.

If fuel pipes are in order.

- Check fuel flow before fuel filter.



### WARNING

*Fuel supply pipes are under pressure! Before loosening hose connections, put a cleaning cloth on connection points. Then depressurize by carefully pulling the hose.*



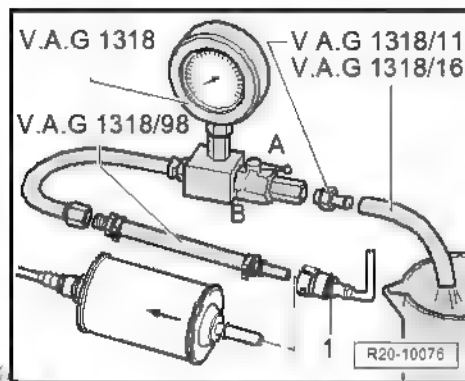
### Note

*For that, press the key on the hose connector.*

- Remove supply hose -1- from fuel filter inlet and connect it to the Adapting set - VAG 1318/98- and the Pressure gauge - VAG 1318- .



- Pressure gauge - VAG 1318- with Adapting set - VAG 1318/98- as shown.
- Install the Adapter - VAG 1318/16- onto Adapter - VAG 1318/11- for Pressure gauge - VAG 1318- and put its end in a graduated container with at least 3.0-litre capacity.
- Open the Pressure gauge - VAG 1318- valve. The valve points towards the fuel passage-A-.
- Actuate the Remote control - VAG 1348/3A- , close the valve slowly until the Pressure gauge - VAG 1318- indicates,
  - ◆ 3.5 bar for BJE and AQZ engines
  - ◆ 4.2 bar for BNX, CCNA, CPBA engines



Do not change the valve position.

- Empty measuring container.
- Check flow again.
- Activate the Remote control - VAG 1348/3A- and valve -A- again, and simultaneously for 30 seconds. Compare the flow value with the one obtained in the first measurement.

If minimum flow is not achieved:

- Remove the Fuel pump (pre-supply pump) - G6- and check whether there is dirt in the screen filter.

If minimum flow is achieved:

- Replace fuel filter.

If the minimum flow is not reached again:

Only if no irregularities have been found so far:

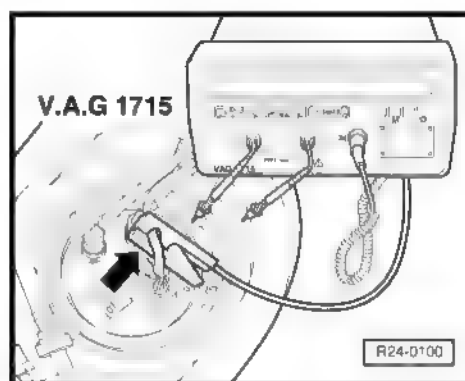
- Fuel pump (pre-supply pump) - G6- - damaged, replace  
⇒ [page 137](#).

If the desired fuel flow is achieved, but at great cost, we may conclude that the fuel supply presents some irregularity (i.e. a temporary fuel supply failure):

- Reconnect the fuel tubes removed.
- By using the electric calliper, connect the Multimeter - VAG 1715- to contact 1, 4-pole connection cable -arrow- on cable harness.
- Run the engine and idle it.
- Measure current draw by the Fuel pump (pre-supply pump) - G6- . Theoretical value:
  - ◆ 7.2 amps max. for AQZ engine
  - ◆ 8.0 amps max. for BJE engine
  - ◆ 8.2 amps max. for BNX, CCNA, CPBA engines

If the current draw is excessive:

- Fuel pump (pre-supply pump) - G6- - damaged, replace  
⇒ [page 137](#) .



### 1.9.3 Fuel pump (pre-supply pump) - G6- retention valve - verify.

Check conditions

- Adapter cable - VAG 1348/3A-



- Pressure gauge - VAG 1318-

#### Checking process

This check tests simultaneously the supply hose connections from the Fuel pump (pre-supply pump) - G6- to the Pressure gauge - VAG 1318- connection for leaks.

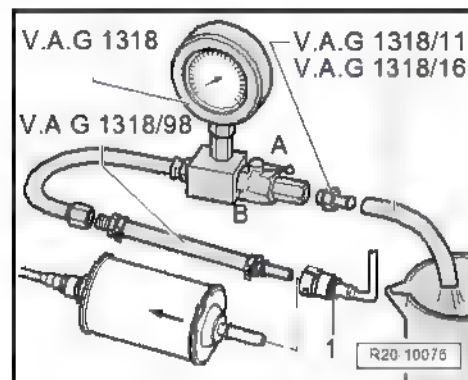
- Remove supply hose -1- from fuel filter inlet and connect it to the Adapting set - VAG 1318/98- and the Pressure gauge - VAG 1318-.
- Install Adapter - VAG 1318/16- on Adapter - VAG 1318/11- of the Pressure gauge - VAG 1318- and put the hose end into a graduated container with a capacity for 3-litres.



#### Note

For that, press the keys on hose connectors.

- Close the valve on the Pressure gauge - VAG 1318- (transverse valve in relation to the flow direction - position -B-).
- Activate the Remote control - VAG 1348/3A- in quick consecutive intervals, until reaching a pressure of approx.
  - ◆ 3.5 bar for BJE and AQZ engines
  - ◆ 4.2 bar for BNX, CCNA, CPBA engines



#### WARNING

*The fuel system is kept under pressure, when opening the valve, hold a container in front of the free connection on the pressure meter.*

- Reduce excess pressure by carefully opening the valve.
- Check the pressure drop on the Pressure gauge - VAG 1318-. After 10 minutes, the pressure should not drop below 2.5 bar.

If the pressure keeps dropping:

- Check hose connections for leaks.

If no irregularity is detected:

- Fuel pump (pre-supply pump) - G6- - damaged, replace  
⇒ [page 137](#).



## 2 Engine power electronic adjustment (electronic accelerator) - check

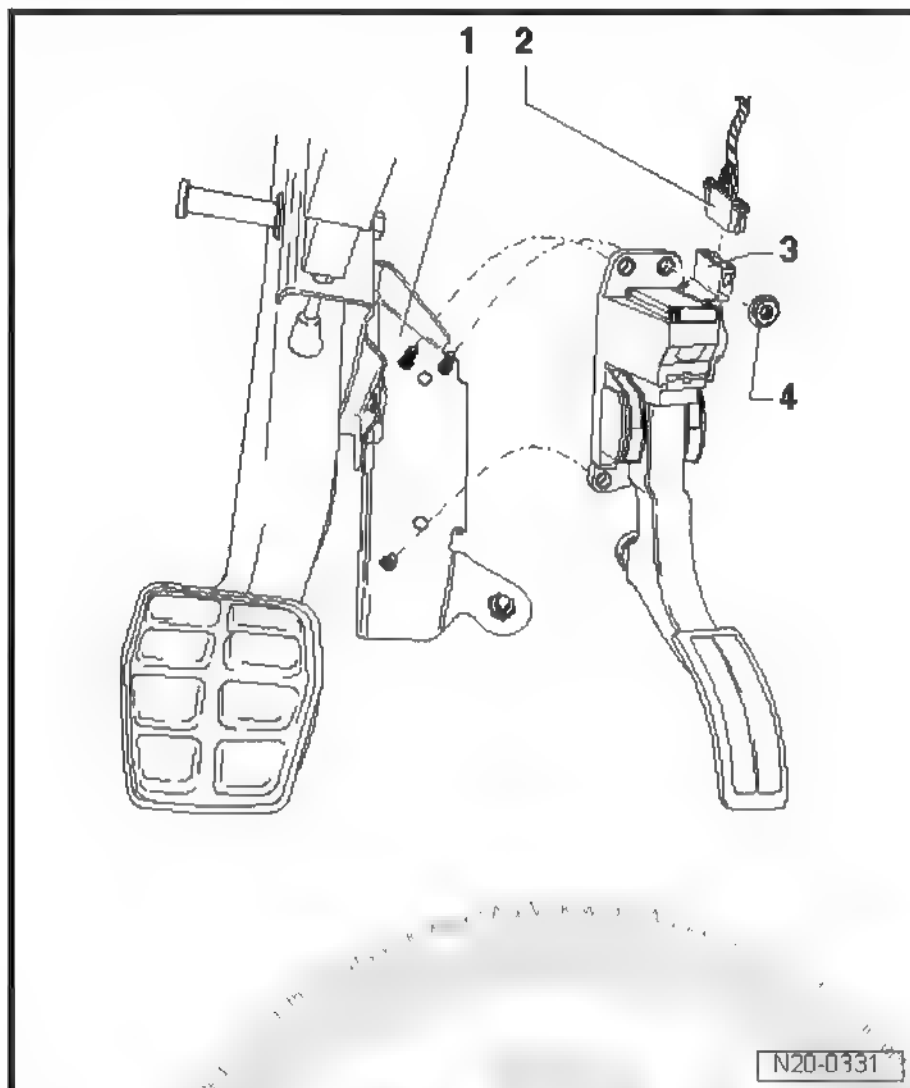
1 - Pedal support

2 - Connector

□ Black, 6 poles

3 - Accelerator pedal position sensor - G79- and Sensor 2 of accelerator pedal position - G185-

4 - 10 Nm



### 2.1 Electronic accelerator system operation

In the electronic accelerator, the throttle valve is not activated by a cable. There is no mechanical connection between the accelerator and the throttle valve.

The position of the accelerator is transmitted to the Engine control unit - J623- by two accelerator position sensors (variable resistance; stored in a housing), which are connected to the accelerator.

The position of the accelerator (at the driver's criterion) is the main input value for the Engine control unit - J623-.

The throttle valve is activated by an electric engine (butterfly element) incorporated to the Throttle valve control unit - J338-, in all load and rotation intervals.

The throttle valve is activated by a butterfly element, according to data provided by the Engine control unit - J623-.

With the engine turned off and the ignition connected, the Engine control unit - J623- activates the butterfly element, due to the data provided by the Accelerator pedal position sensor - G79- and Ac-



celerator pedal position sensor 2 - G185-. This means that if the accelerator is half activated, the butterfly element will open proportionally, that is, the throttle valve will be half opened.

With the engine running (loaded), the Engine control unit - J623- may open or close the butterfly, regardless the Accelerator pedal position sensor - G79- and Accelerator pedal position sensor 2 - G185-.

Accordingly, the throttle valve may, for instance, be completely open already, even if the accelerator is only half activated. The benefit is being able to avoid losses from choking, caused by the throttle valve.

Furthermore, this enables lower fuel consumption and emissions of pollutants for certain load conditions.

The necessary torque may be obtained by the Engine control unit - J623-, through an optimal combination between the throttle valve opening and the over-supply pressure.

It would be a mistake to believe that the electronic accelerator consists of only one or two components. The electronic throttle is a system, comprised by all the components that contribute for determining the throttle valve position, in order to adjust and activate it, such as, for example, Accelerator pedal position sensor - G79- and Accelerator pedal position sensor 2 - G185-, Throttle valve module - J338-, EPC LED, Engine control unit - J623-, etc.).

Follow applicable safety measures ⇒ [page 126](#) .

Follow applicable cleaning rules ⇒ [page 127](#) .



## 3 Activated charcoal filter system

### 3.1 Operation

Depending on the local air temperature and pressure, fuel vapours may form over the surface of the fuel in the tank.

The activated charcoal filter system prevents these hydrocarbon emissions from reaching the air we breathe.

Limited amounts of fuel vapours reach the activated charcoal filter, located in the highest point of the tank, through a gravity valve (which closes at a 45° inclination) and the pressure retention valve.

The activated charcoal absorbs these vapours like a sponge.

During the vehicle operation and with the lambda control active (hot engine), the Magnetic valve 1 for the activated charcoal filter - N80- , also known as regeneration valve, is activated cyclically by the Engine control unit - J623- , in function of its load and engine speed (rpm) regime. The opening interval depends on the input signals.

Intake manifold vacuum aspirates fresh air through the ventilation opening on the lower part of the activated charcoal filter during the purging procedure (activated charcoal regeneration). The fuel vapours stored in the activated charcoal and the fresh air are fed for combustion in controlled quantities.

The pressure retention valve prevents fuel vapours from being aspirated directly from the tank, when the Magnetic valve 1 for the activated charcoal filter - N80- is opened and there is vacuum in the intake manifold. Accordingly, this ensures priority drainage for the activated charcoal filter.

In the absence of current (e.g. harness interruption), Magnetic valve 1 for the activated charcoal filter - N80- remains closed. The activated charcoal filter will not be purged.



#### Note

- ◆ *The hose connections are fastened by spring clamps or quick coupling.*
- ◆ *To install spring clamps, we recommend using the Standard-type clamp pliers - VW 5162- or Standard-type clamp pliers - VAS 5024A-.*

Follow applicable safety measures ⇒ [page 126](#) .

Follow applicable cleaning rules ⇒ [page 127](#) .

### 3.2 Activated charcoal filter system components - repair



**1 - Air venting pipes**

- ☐ Make sure it is well fastened.

**2 - Pressure retention valve with connection hose**

- ☐ Make sure it is well fastened
- ☐ From the gravity valve in the fuel reservoir

**3 - Activated charcoal filter**

- ☐ Installation location: in the right rear wheel case.

**4 - Vent connection**

- ☐ Visible from below.

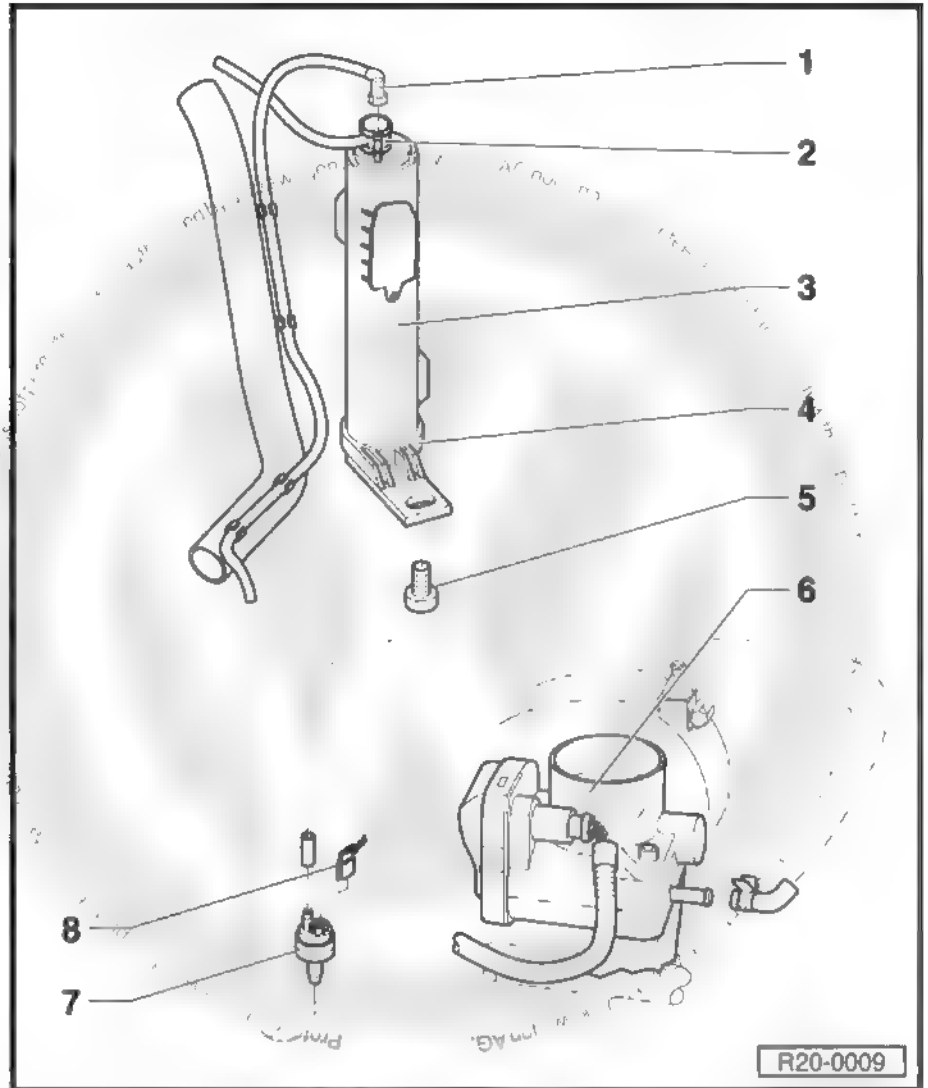
**5 - 10 Nm**

**6 - Throttle valve control unit - J338-**

**7 - Magnetic valve I for activated charcoal tank - N80-**

- ☐ The Activated charcoal filter solenoid valve I - N80- will close when the ignition is off.
- ☐ The Activated charcoal filter solenoid valve I - N80- is activated (by pulses) via Engine control unit - J623- , when the engine is at the operating temperature.

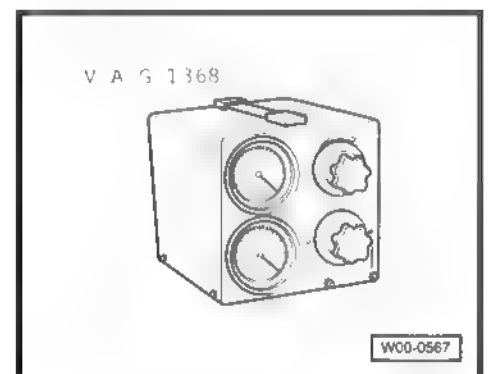
**8 - Connector**



### 3.3 Fuel tank ventilation - check

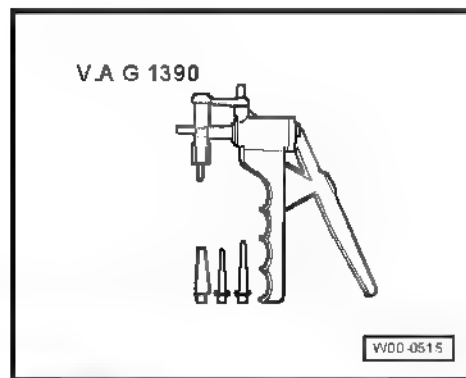
Special tools and workshop equipment required

- ◆ Vacuum gauge - VAG 1368-





- ◆ Vacuum pump - VAG 1390 (VWB) - ou - VAS 6213-



#### Test conditions

- The ignition must be OFF.

#### Test sequence

- Release the breather hose -1- from the activated charcoal filter on the Magnetic valve I for the activated charcoal filter - N80-2-.
- Connect the Vacuum pump - VAS 6213- or Vacuum pump - VAG 1390- and the Vacuum gauge - VAG 1368- as indicated on the hose -1-.
- Place the Vacuum gauge - VAG 1368- in position -A/B-.
- Operate the Vacuum pump - VAS 6213- or Vacuum pump - VAG 1390- several times. No vacuum should be created.

#### If there is vacuum:

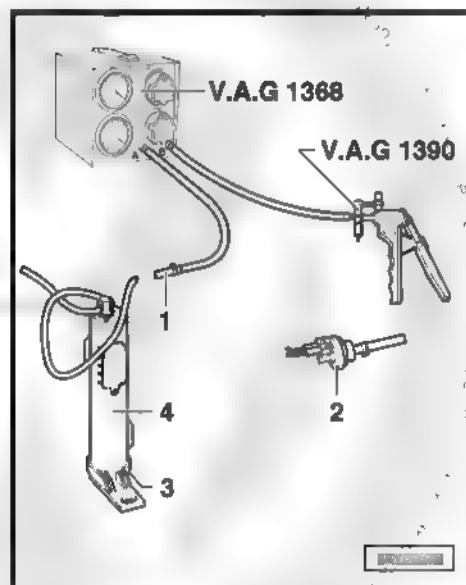
- Check whether the breather hose -3- of the activated charcoal filter -4- is dirty, and if necessary, clean it.

#### If there is no vacuum:

- Plug the breather hose -3- and re-activate the vacuum pump - VAS 6213- several times. Vacuum should be generated.

#### If there is no vacuum:

- Replace the activated charcoal filter.







## 24 – Mixture preparation - injection

### 1 Injection system - repair

#### 1.1 General instructions regarding the injection system

- ◆ The Engine control unit - J623- is equipped with a self-diagnosis system. Before carrying out repairs, and for troubleshooting, refer to the event memory. Likewise, check vacuum hoses and connections (air infiltration).
- ◆ The fuel hoses in the engine compartment must only be installed with spring clamps. Using retaining clamps or screwed clamps is not allowed.
- ◆ A minimum voltage of 11.5V is necessary for the perfect operation of electrical components.
- ◆ Do not use silicone-based sealants. Silicone residues sucked in by the engine do not burn and may damage the Lambda Probe - G39-.

Safety measures ⇒ [page 171](#) .

Cleaning rules ⇒ [page 173](#) .

Technical data ⇒ [page 173](#) .

#### 1.2 Component location

##### 1.2.1 AQZ, BJE and BNX engines

Components A to D are not represented in the illustration.



**A - Brake light switch - F-**

- ❑ Together in one case, in the feet compartment, on the brake pedal.

**B - Accelerator pedal position sensor - G79- and Sensor 2 of accelerator pedal position - G185-**

- ❑ At the feet compartment, on the accelerator pedal → [page 150](#) .

**C - Clutch pedal switch - F36-**

- ❑ In feet compartment, on clutch pedal.

**D - Fuel pressure regulator**

- ❑ On the Fuel pump (pre-supply pump) - G6-

**1 - Cold start system gasoline tank**

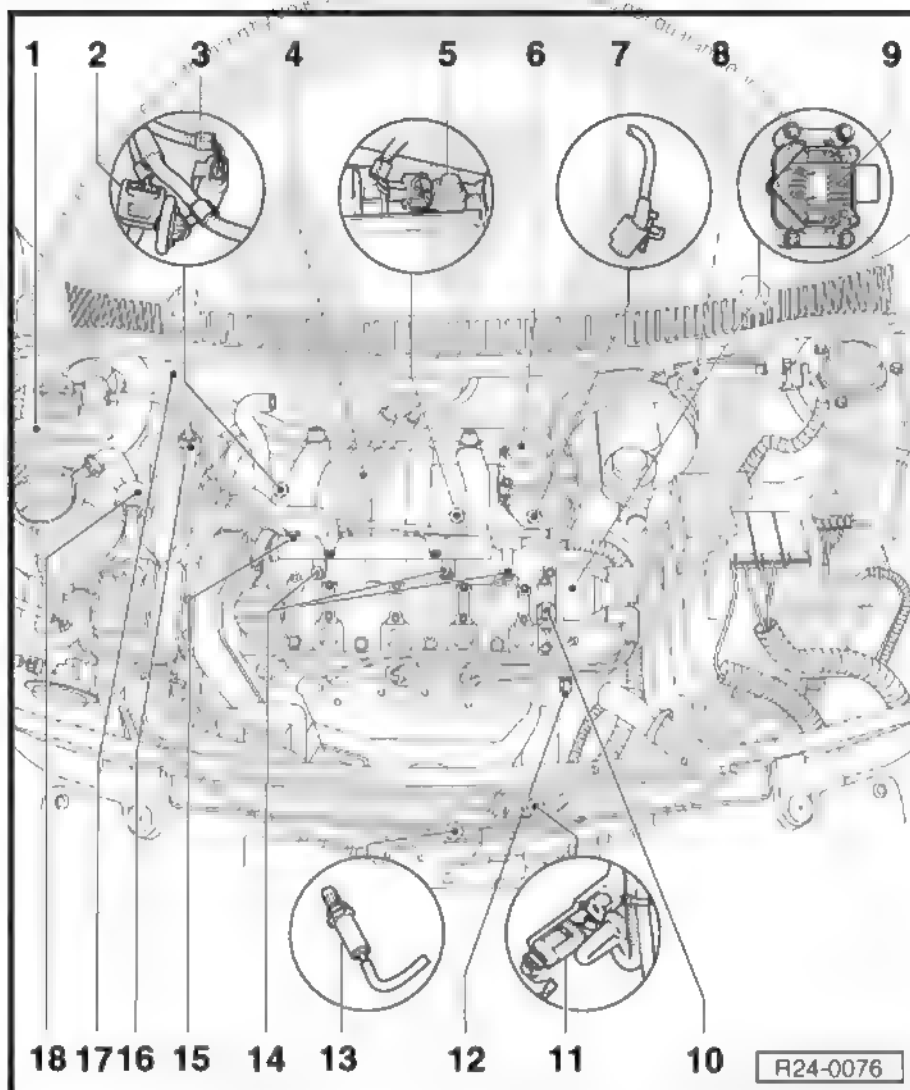
- ❑ BJE and BNX engines.

**2 - Connector**

- ❑ Black, 3 poles.
- ❑ To the Engine speed sensor - G28- .
- ❑ To remove the Engine speed sender - G28- remove intake manifold.

**3 - Connector**

- ❑ Black, 4 poles.
- ❑ To the Intake manifold pressure sensor - G71- with the Air intake tem-





- perature sensor - G42- .
- 4 - Intake manifold
- ☐ Remove and install ➔ [page 168](#) .
- 5 - Knock sensor 1 - G61-
- ☐ Installation location: On engine block, intake side.
- 6 - Throttle valve control unit - J338-
- 7 - Engine speed sensor - G28-
- ☐ Installation location: On engine block, intake side.
  - ☐ To remove the Engine speed sender - G28- , remove intake manifold.
  - ☐ Sensor securing bolt's torque: 5 Nm.
- 8 - Engine control unit - J623-
- ☐ Fit or remove the connector only with ignition switched off.
  - ☐ Unlock to unslot.
- 9 - Ignition transformer - N152-
- ☐ With codes for ignition cables, do not confuse.
  - ☐ ➔ [Item 2 \(page 193\)](#) .
- 10 - Hall Sender - G40-
- ☐ ➔ [Item 8 \(page 193\)](#) .
- 11 - Connector
- ☐ Black, 4 poles.
  - ☐ For Lambda probe - G39- before the catalytic converter and Lambda probe heating - Z19- .
- 12 - Coolant temperature sensor - G62-
- 13 - Lambda probe - G39-
- ☐ 50 Nm
  - ☐ Installation location: On the exhaust tube, front part.
- 14 - Cylinder 1 injector - N30 - , Cylinder 2 injector - N31 - , Cylinder 3 injector - N32 - and Cylinder 4 injector - N33-
- 15 - Fuel distributor
- 16 - Unidirectional valve
- 17 - Cold start valve - N17-
- ☐ BJE and BNX engines.
- 18 - Magnetic valve 1 for activated charcoal tank - N80-

## 12.2 CCNA Engine

Components A to D are not represented in the illustration.



Version Novo Fox has Lambda Probe after catalytic converter - G130- .

**A - Brake light switch - F-**

- ❑ Together in one case, in the feet compartment, on the brake pedal.

**B - Accelerator pedal position sensor - G79- and Sensor 2 of accelerator pedal position - G185-**

- ❑ At the feet compartment, on the accelerator pedal ➔ [page 150](#) .

**C - Clutch pedal switch - F36-**

- ❑ In feet compartment, on clutch pedal.

**D - Fuel pressure regulator**

- ❑ On the Fuel pump (pre-supply pump) - G6- .

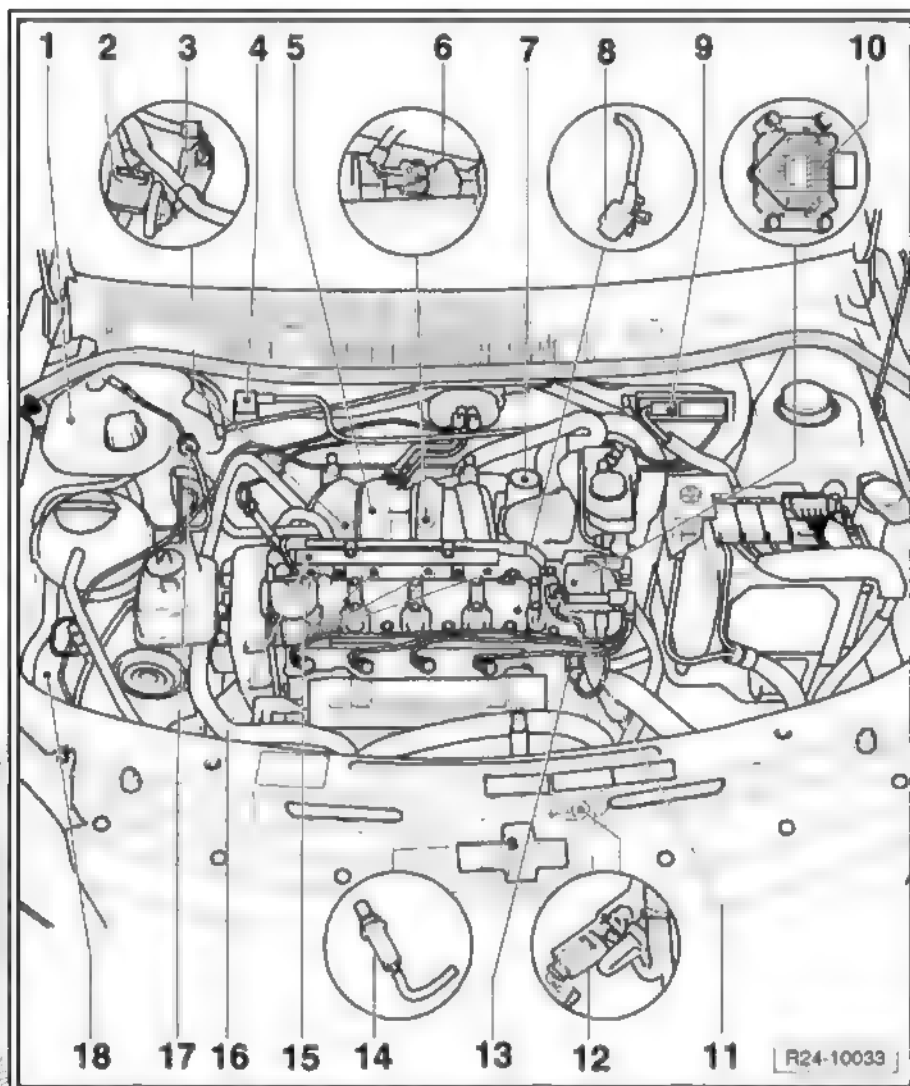
**1 - Cold start system gasoline tank**

**2 - Connector**

- ❑ Black, 3 poles.
- ❑ To the Engine speed sensor - G28- .
- ❑ To remove the Engine speed sender - G28- remove intake manifold.

**3 - Connector**

- ❑ Black, 4 poles.
- ❑ To the Intake manifold pressure sensor - G71- with the Air intake tem-





- perature sensor - G42- .
- 4 - Cold start valve - N17-
- 5 - Intake manifold
  - ☐ Remove and install ➤ [page 168](#) .
- 6 - Knock sensor 1 - G61-
  - ☐ Installation location: On engine block, intake side.
- 7 - Throttle valve control unit - J338-
  - ☐ Fit or remove the connector only with ignition switched off.
- 8 - Engine speed sensor - G28-
  - ☐ To remove the Engine speed sender - G28- , remove intake manifold.
  - ☐ Sensor securing bolt's torque: 5 Nm.
- 9 - Engine control unit - J623-
- 10 - Ignition transformer - N152-
  - ☐ With codes for ignition cables, do not confuse.
  - ☐ ➤ [Item 2 \(page 193\)](#) .
  - ☐ New Ignition transformer - N152- 4 X 1 from 08/2009 ➤ [Item 2 \(page 194\)](#) .
- 11 - Hall Sender - G40-
  - ☐ ➤ [Item 8 \(page 193\)](#) .
- 12 - Connector
  - ☐ Black, 4 poles.
  - ☐ For Lambda probe - G39- before the catalytic converter and Lambda probe heating - Z19- .
- 13 - Coolant temperature sensor - G62-
- 14 - Lambda probe - G39-
  - ☐ 50 Nm
  - ☐ Located in the catalytic converter, near the exhaust manifold.
- 15 - Cylinder 1 injector - N30 - , Cylinder 2 injector - N31 - , Cylinder 3 injector - N32 - and Cylinder 4 injector - N33-
- 16 - Fuel distributor
- 17 - Unidirectional valve
- 18 - Magnetic valve I for activated charcoal tank - N80-

### 1.2.3 CPBA Engine

Components A to D are not represented in the illustration.



Version Novo Fox has Lambda Probe after catalytic converter - G130- .

**A - Brake light switch - F-**

- ❑ Together in one case, in the feet compartment, on the brake pedal.

**B - Accelerator pedal position sensor - G79- and Sensor 2 of accelerator pedal position - G185-**

- ❑ At the feet compartment, on the accelerator pedal ➔ [page 150](#) .

**C - Clutch pedal switch - F36-**

- ❑ In feet compartment, on clutch pedal.

**D - Fuel pressure regulator**

- ❑ On the Fuel pump (pre-supply pump) - G6- .

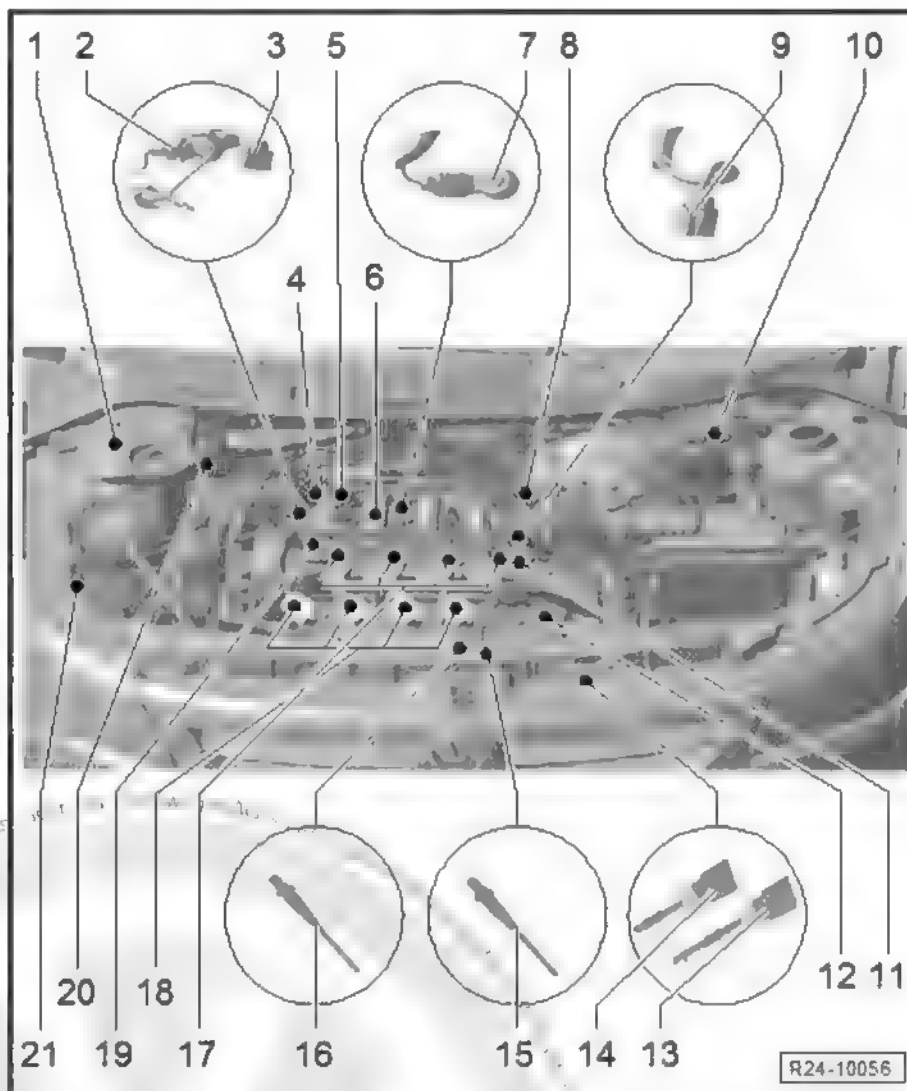
**1 - Cold start system gasoline tank**

**2 - Connector**

- ❑ Black, 3 poles.
- ❑ To the Engine speed sensor - G28- .
- ❑ To remove the Engine speed sender - G28- remove intake manifold.

**3 - Connector**

- ❑ Black, 4 poles.
- ❑ To the Intake manifold pressure sensor - G71- with the Air intake tem-





- perature sensor - G42- .
- 4 - Cold start valve - N17-
- 5 - Intake manifold
- ☐ Remove and install ➤ [page 167](#) .
- 6 - Cold start system fuel distributor
- 7 - Knock sensor 1 - G61-
- ☐ Installation location: On engine block, intake side.
- 8 - Throttle valve control unit - J338-
- ☐ Fit or remove the connector only with ignition switched off.
- 9 - Engine speed sensor - G28-
- ☐ To remove the Engine speed sender - G28- , remove intake manifold.
  - ☐ Sensor securing bolt's torque: 5 Nm.
- 10 - Engine control unit - J623-
- 11 - Hall Sender - G40-
- 12 - Coolant temperature sensor - G62-
- 13 - Connector
- ☐ Brown, 4 contacts.
  - ☐ To Lambda probe after the catalytic converter - G130-
- 14 - Connector
- ☐ Black, 4 poles.
  - ☐ For the Lambda probe - G39- before the catalytic converter and Lambda probe heating - Z19-
- 15 - Lambda probe behind catalytic converter - G130-
- ☐ 50 Nm
- 16 - Lambda probe - G39-
- ☐ 50 Nm
  - ☐ Located in the catalytic converter, near the exhaust manifold.
- 17 - Cylinder 1 injector - N30 - , Cylinder 2 injector - N31 - , Cylinder 3 injector - N32 - and Cylinder 4 injector - N33-
- 18 - Ignition coil 1 with final power stage - N70- , Ignition coil 2 with final power stage - N127- , Ignition coil 3 with final power stage - N291- , Ignition coil 4 with final power stage - N292-
- 19 - Fuel distributor
- 20 - Unidirectional valve
- 21 - Magnetic valve I for activated charcoal tank - N80-





### 1.3 Injection components - remove and install

AQZ, BJE and BNX engines

#### 1 - Connector

- ☐ For Engine control unit - J623-.
- ☐ Connect or disconnect the connector only with ignition switched off.
- ☐ Unlock to unsnot.

#### 2 - Engine control unit - J623-

- ☐ For the injection system, lambda adjustment, magnetic valve I for the activated charcoal tank, knock adjustment, speed limit, ignition and self-diagnosis.
- ☐ When replacing the Engine control unit - J623-, adjust to Immobiliser control unit - J362-  
⇒ [page 182](#)

#### 3 - Connector

- ☐ Black, 4 poles.
- ☐ From the Intake manifold pressure sensor - G71- with the Air intake temperature sensor - G42-.
- ☐ Gold plated connector contacts.

#### 4 - Connector

- ☐ Black, 3 poles.
- ☐ From Engine speed sensor - G28-.
- ☐ To remove the Engine speed sender - G28-, remove intake manifold.

#### 5 - Air filter set

- ☐ Remove and install the air filter set ⇒ [page 170](#)
- ☐ Disassemble and assemble ⇒ [page 169](#).

#### 6 - Fastening clip

- ☐ Observe model.

#### 7 - Cable guide

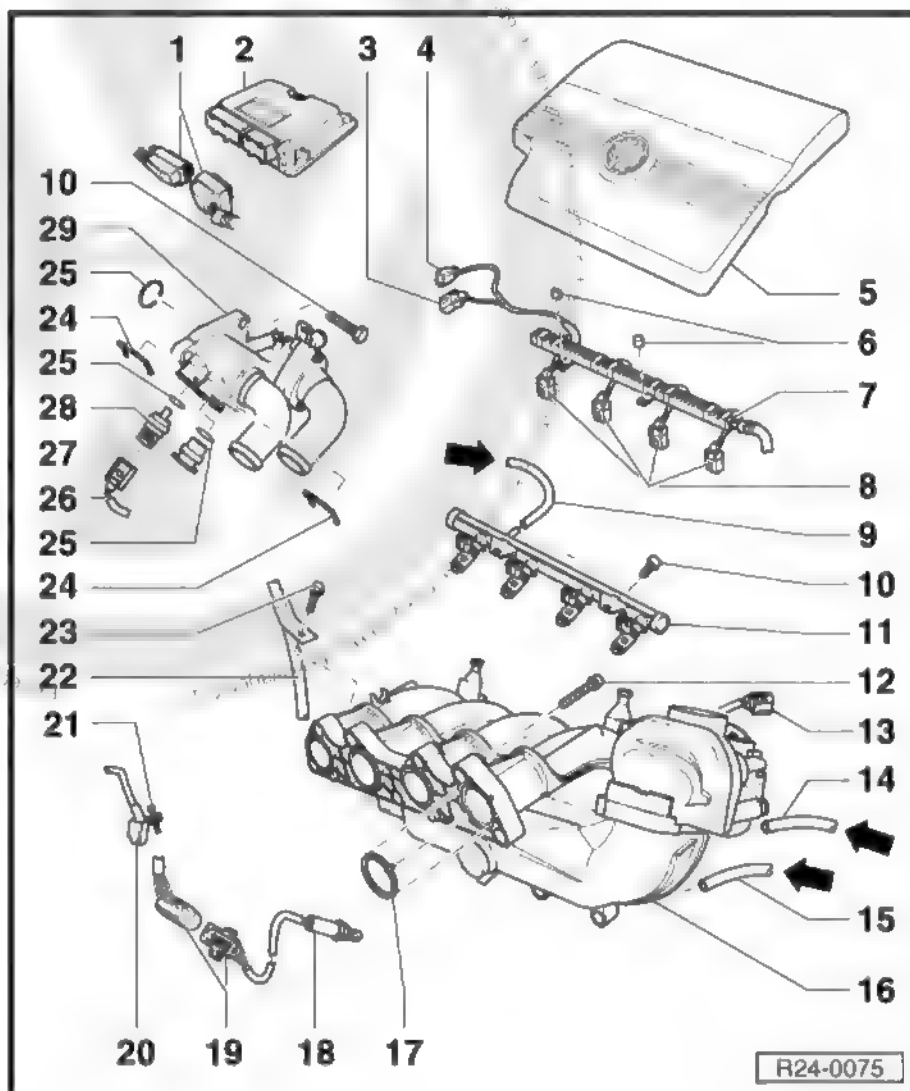
- ☐ Fastened to the fuel distributor

#### 8 - Connector

- ☐ Black, 2 poles.
- ☐ From the Cylinder 1 injector - N30-, Cylinder 2 injector - N31-, Cylinder 3 injector - N32- and Cylinder 4 injector - N33-.

#### 9 - Fuel supply lines

- ☐ Black with white mark
- ☐ Fasten with spring braces
- ☐ Make sure it is well fastened.







- ☐ From the fuel filter.
- 10 - 10 Nm
- 11 - Fuel distributor with injectors
  - ☐ Remove and install ➔ [page 168](#) .
- 12 - 25.0 Nm
- 13 - Connector
  - ☐ Black, 6 poles.
  - ☐ For Throttle valve control unit - J338- .
  - ☐ Gold plated connector contacts.
- 14 - For Magnetic valve I for the activated charcoal tank - N80-
  - ☐ Fasten with spring braces.
- 15 - For brake servo
- 16 - Intake manifold
  - ☐ Remove and install ➔ [page 167](#) .
- 17 - Seal
  - ☐ Replace.
  - ☐ Check installation position.
- 18 - Lambda probe - G39- before the catalytic converter
  - ☐ 50 Nm
  - ☐ Installation location: On the exhaust tube, front part.
  - ☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- ; ensure that the High-temperature paste - G 052 112 A3- does not reach the slits on the body of the Lambda probe - G39- .
  - ☐ Remove and install with the Set of sockets for Lambda probe - 3337- .
  - ☐ Power is supplied to heat the Lambda probe - G39- through the Fuel pump relay - J17- .
- 19 - Connector
  - ☐ Black, 4 poles.
  - ☐ For the Lambda probe - G39- before the catalytic converter and Lambda probe heating - Z19- .
  - ☐ Contacts 3 and 4 gold plated.
- 20 - Engine speed sensor - G28-
  - ☐ Installation location: On engine block, intake side.
  - ☐ To remove the Engine speed sender - G28- , remove intake manifold.
  - ☐ Sensor securing bolt's torque: 5 Nm.
- 21 - 5 Nm
- 22 - Guide tube
  - ☐ To the oil dipstick.
- 23 - 3 Nm
- 24 - Clip
  - ☐ Make sure it is well fastened.
- 25 - Seal
  - ☐ Replace
- 26 - Connector
  - ☐ Black, 4 poles.
  - ☐ From Coolant temperature sensor - G62- .
  - ☐ Gold plated connector contacts.
- 27 - Sealing plug
  - ☐ If necessary, depressurize the system before removal



## 28 - Coolant temperature sensor - G62-

- ☐ From the Engine control unit - J623- .
- ☐ If necessary, depressurize the system before removal.
- ☐ Resistance values between contact 1 and 2 ➔ [page 166](#)

## 29 - Cooling system thermostat valve body

### CCNA and CPBA engines

Version Novo Fox has Lambda Probe after catalytic converter - G130-

#### 1 - Connector

- ☐ For Engine control unit - J623- .
- ☐ Connect or disconnect the connector only with ignition switched off.
- ☐ Unlock to unsnot.

#### 2 - Engine control unit - J623-

- ☐ For the injection system, lambda adjustment, magnetic valve I for the activated charcoal tank, knock adjustment, speed limit, ignition and self-diagnosis.
- ☐ When replacing the Engine control unit - J623- , adjust to Immobiliser control unit - J362- ➔ [page 182](#) .

#### 3 - Connector

- ☐ Black, 4 poles.
- ☐ From the Intake manifold pressure sensor - G71- with the Air intake temperature sensor - G42- .
- ☐ Gold plated connector contacts.

#### 4 - Connector

- ☐ Black, 3 poles.
- ☐ From Engine speed sensor - G28- .
- ☐ To remove the Engine speed sender - G28- , remove intake manifold

#### 5 - Air filter set

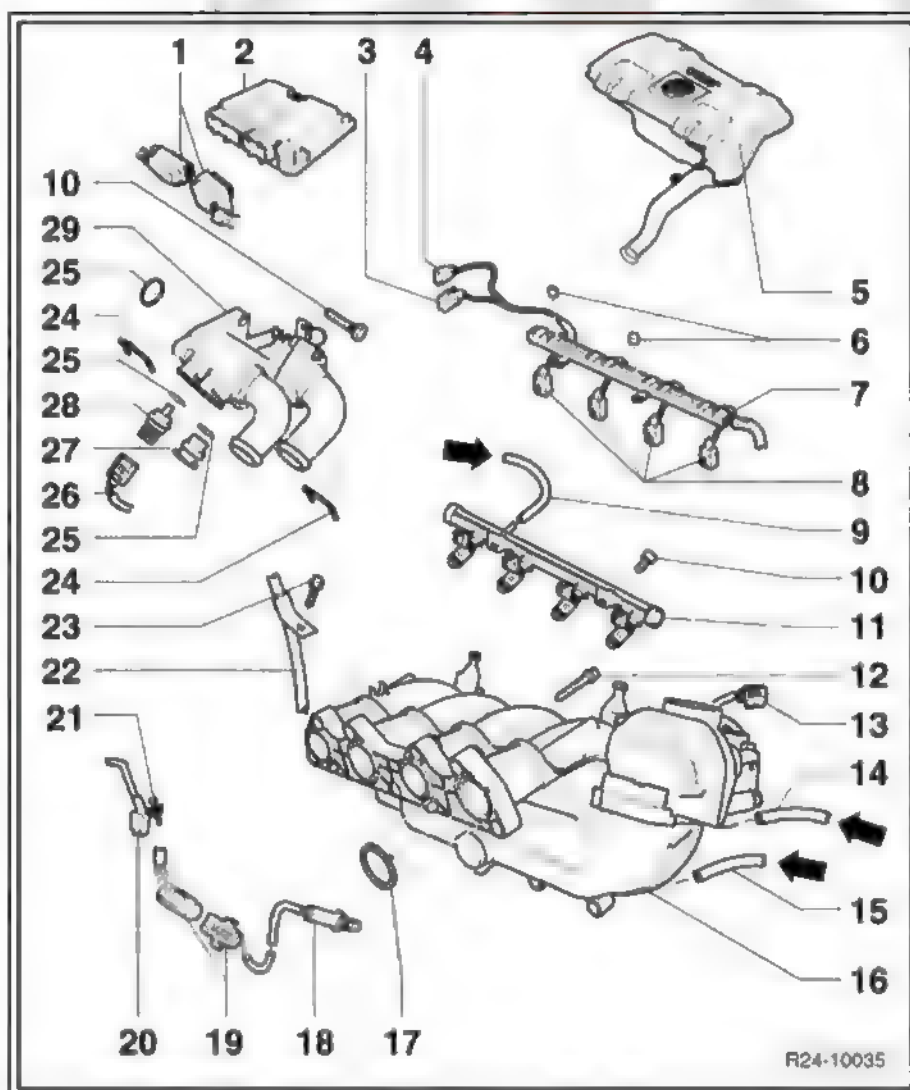
- ☐ Remove and install the air filter set ➔ [page 170](#)
- ☐ Disassemble and assemble ➔ [page 169](#) .

#### 6 - Fastening clip

- ☐ Observe model.

#### 7 - Cable guide

- ☐ Fastened to the fuel distributor



R24-10035



8 - Connector

- ☐ Black, 2 poles.
- ☐ From the Cylinder 1 injector - N30- , Cylinder 2 injector - N31- , Cylinder 3 injector - N32- and Cylinder 4 injector - N33- .

9 - Fuel supply lines

- ☐ Black with white mark
- ☐ Fasten with spring braces
- ☐ Make sure it is well fastened.
- ☐ From the fuel filter.

10 - 10 Nm

11 - Fuel distributor with injectors

- ☐ Remove and install ⇒ [page 168](#) .

12 - 25 Nm

13 - Connector

- ☐ Black, 6 poles.
- ☐ For Throttle valve control unit - J338- .
- ☐ Gold plated connector contacts.

14 - For Magnetic valve I for the activated charcoal tank - N80-

- ☐ Fasten with spring braces.

15 - For brake servo

16 - Intake manifold

- ☐ Remove and install ⇒ [page 167](#) .

17 - Seal

- ☐ Replace.
- ☐ Check installation position.

18 - Lambda probe - G39- before the catalytic converter

- ☐ 50 Nm
- ☐ Installation location: On the exhaust tube, front part.
- ☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- ; ensure that the High-temperature paste - G 052 112 A3- does not reach the slits on the body of the Lambda probe - G39- .
- ☐ Remove and install with the Set of sockets for Lambda probe - 3337- .
- ☐ Power is supplied to heat the Lambda probe - G39- through the Fuel pump relay - J17- .

19 - Connector

- ☐ Black, 4 poles.
- ☐ For the Lambda probe - G39- before the catalytic converter and Lambda probe heating - Z19- .
- ☐ Contacts 3 and 4 gold plated.

20 - Engine speed sensor - G28-

- ☐ Installation location: On engine block, intake side.
- ☐ To remove the Engine speed sender - G28- , remove intake manifold.
- ☐ Sensor securing bolt's torque: 5 Nm.

21 - 5 Nm

22 - Guide tube

- ☐ To the oil dipstick.

23 - 3 Nm

24 - Clip

- ☐ Make sure it is well fastened.



25 - Seal

- ☐ Replace

26 - Connector

- ☐ Black, 4 poles.
- ☐ From Coolant temperature sensor - G62- .
- ☐ Gold plated connector contacts.

27 - Sealing plug

- ☐ If necessary, depressurize the system before removal

28 - Coolant temperature sensor - G62-

- ☐ From the Engine control unit - J623- .
- ☐ If necessary, depressurize the system before removal
- ☐ Resistance values between contact 1 and 2 ⇒ [page 166](#)

29 - Cooling system thermostat valve body

Resistance values of the Coolant temperature sensor - G62-

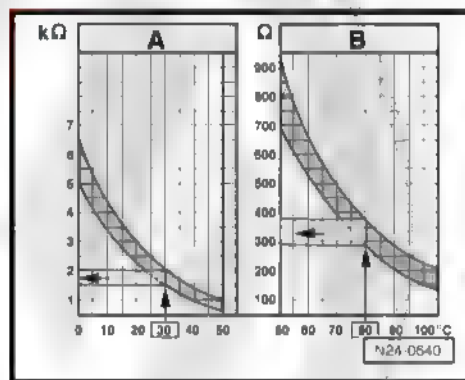
The diagram is divided into two temperature regions:

A - from 0...50 °C

B - from 50...105 °C

Sample reading:

- ◆ 30° C in region A corresponds to a resistance of 1.5...2.0 kΩ.
- ◆ 80° C in region B corresponds to a resistance of 275...375 Ω.





## 1.4 Intake manifold - remove and install

### 1 - Seal

- ☐ Replace if damaged.

### 2 - Throttle valve control unit - J338-

- ☐ When replacing, adjust the Engine control unit - J623- to the Throttle valve command unit - J338- ➔ [page 182](#) .

### 3 - 7 Nm

### 4 - 25 Nm

### 5 - Intake manifold

- ☐ Remove and install ➔ [page 162](#) .

### 6 - Seal

- ☐ Replace.
- ☐ Observe installation position.

### 7 - Seal

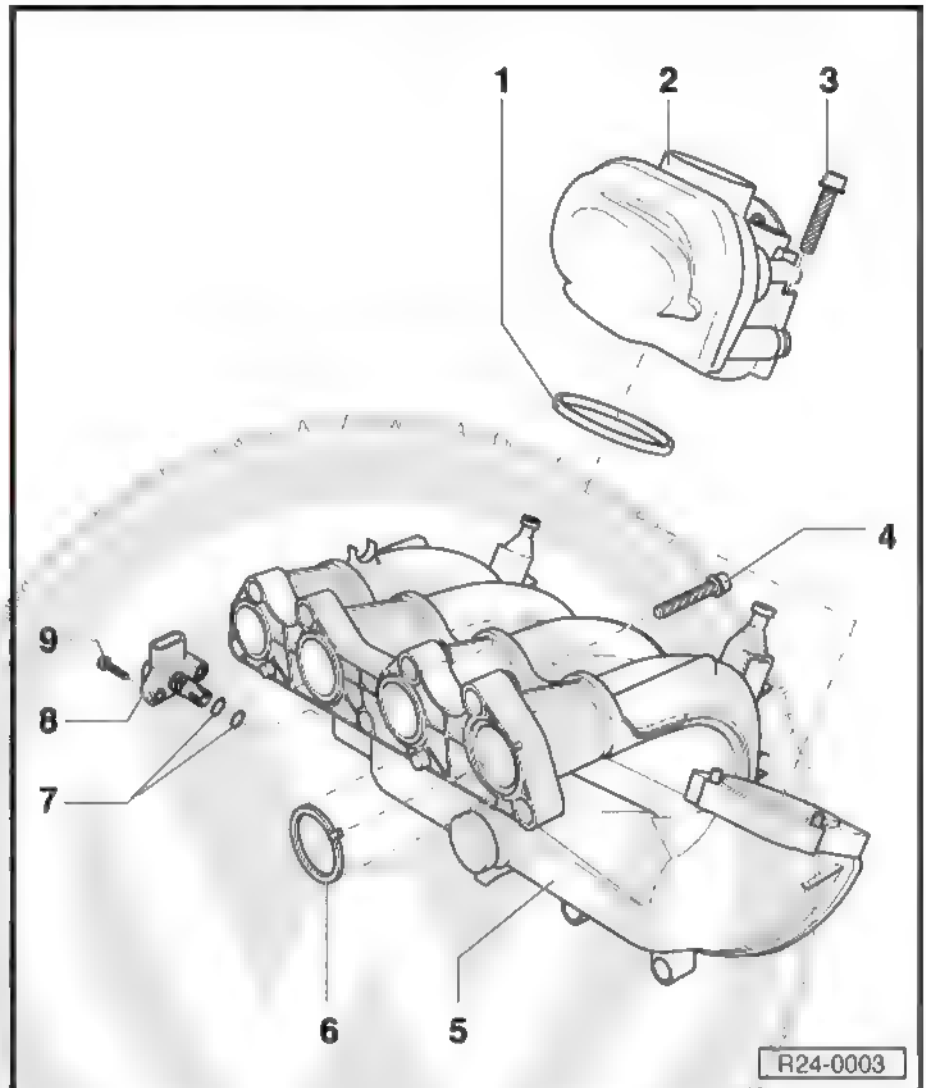
- ☐ Replace if damaged.

### 8 - Intake manifold pressure sensor - G71- with Air intake temperature sensor - G42-

- ☐ Resistance values between contact 1 and 2 ➔ [page 167](#)

### 9 - 3 Nm

- ☐ Observe indications on installation ➔ [page 171](#) .



Resistance values for the Air intake temperature sensor - G42-

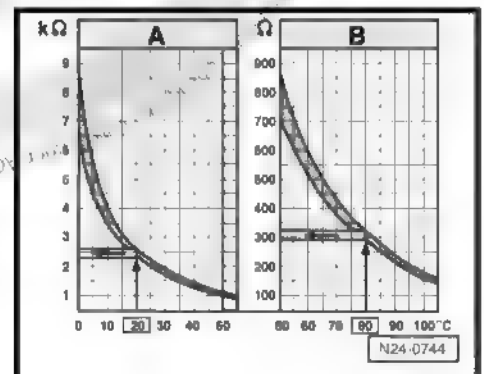
The diagram is divided into two temperature regions:

A - from 0...50° C.

B - from 50...105° C.

Sample reading:

- ◆ 20° C in region A corresponds to a resistance of 2.3...2.6 kΩ.
- ◆ 80° C in region B corresponds to a resistance of 290...330 Ω.





## 1.5 Fuel distributor with injectors - removal and installation

### 1 - Fuel distributor

- ☐ Remove and install  
→ [page 174](#) .
- ☐ Check fuel pressure  
regulator → [page 176](#) .

### 2 - 8 Nm

### 3 - Clip

- ☐ Make sure it is well fastened.
- ☐ Observe the proper seating in the fuel distributor and injector.

### 4 - Seal

- ☐ Replace after each removal.
- ☐ Lightly lubricate with engine clean oil before installation.

### 5 - Cylinder 1 injector - N30- , Cylinder 2 injector - N31- Cylinder 3 injector - N32- and Cylinder 4 injector - N33- )

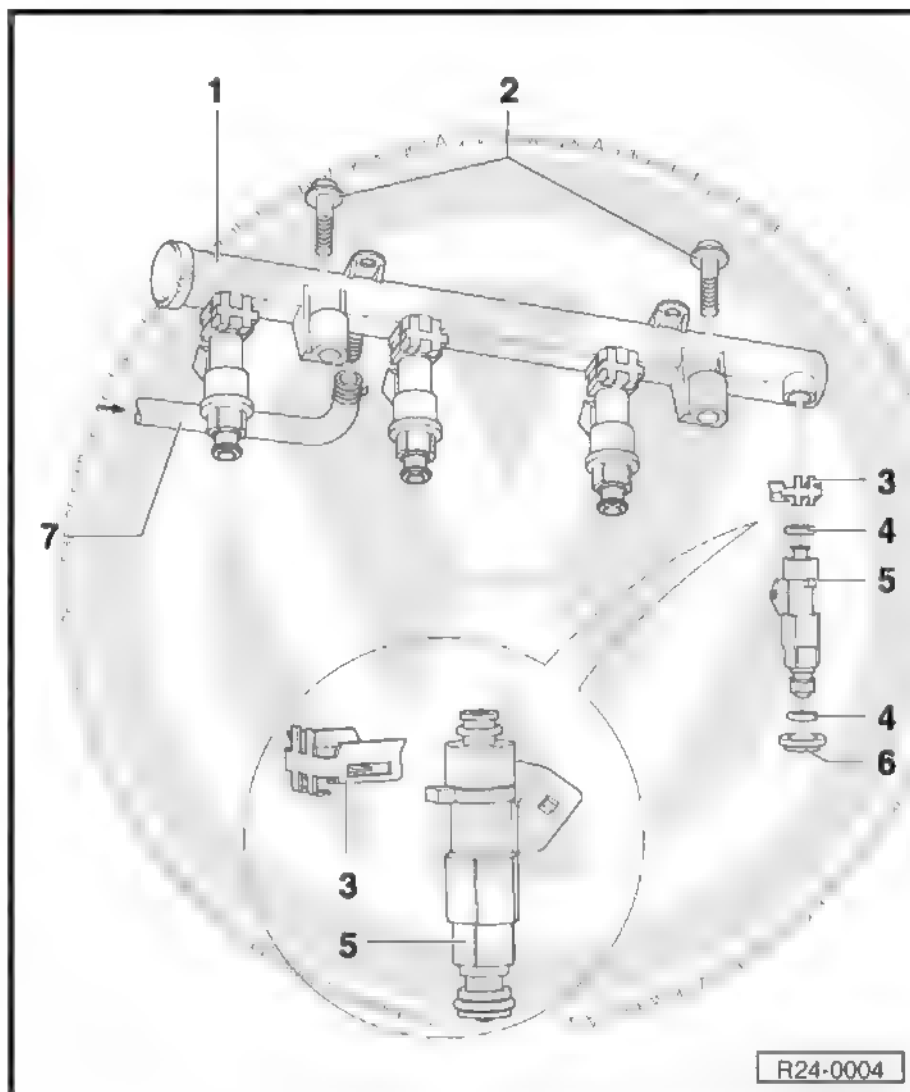
- ☐ Resistance between valve contacts: 12...17  $\Omega$ .

### 6 - Seal

- ☐ Observe installation position.
- ☐ Replace when damaged.

### 7 - Fuel supply lines

- ☐ Black with white mark.
- ☐ Fasten with spring braces.
- ☐ Make sure it is well fastened.
- ☐ From the fuel filter.





## 1.6 Air filter set - assemble and disassemble

### 1.6.1 AQZ, BJE and BNX engines

Remove and install air filter case ➤ [page 170](#) .

#### 1 - Air intake nozzle

- ☐ Location: Fastening screw torque 1.5 Nm.

#### 2 - Seal

- ☐ Ensure firm seating.
- ☐ Replace when damaged.

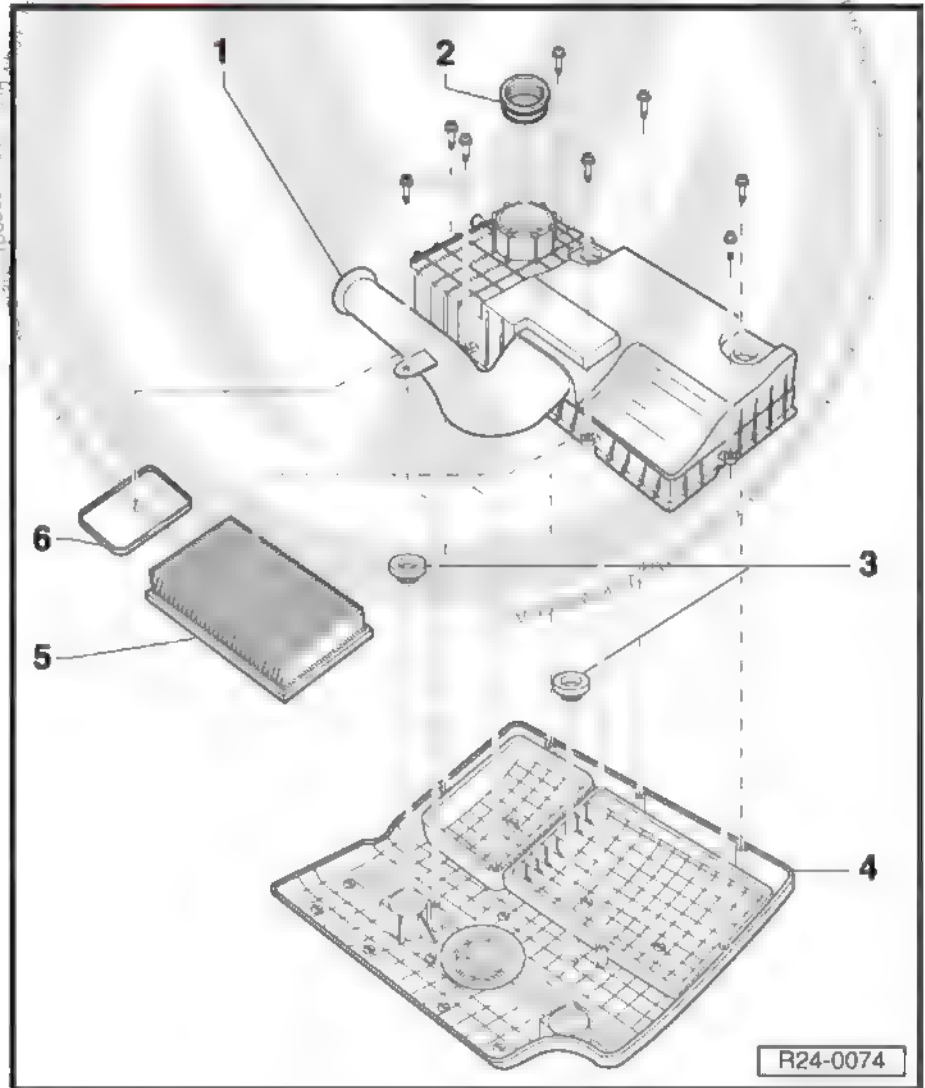
#### 3 - Rubber bearing

#### 4 - Upper part of the air filter case

#### 5 - Filtering element

#### 6 - Sealing gasket

- ☐ Observe installation position.
- ☐ Replace when damaged.







## 1.6.2 CCNA and CPBA engines

### 1 - Air intake nozzle

- ❑ Location: Fastening screw torque 1.5 Nm.

### 2 - Seal

- ❑ Ensure firm seating
- ❑ Replace when damaged

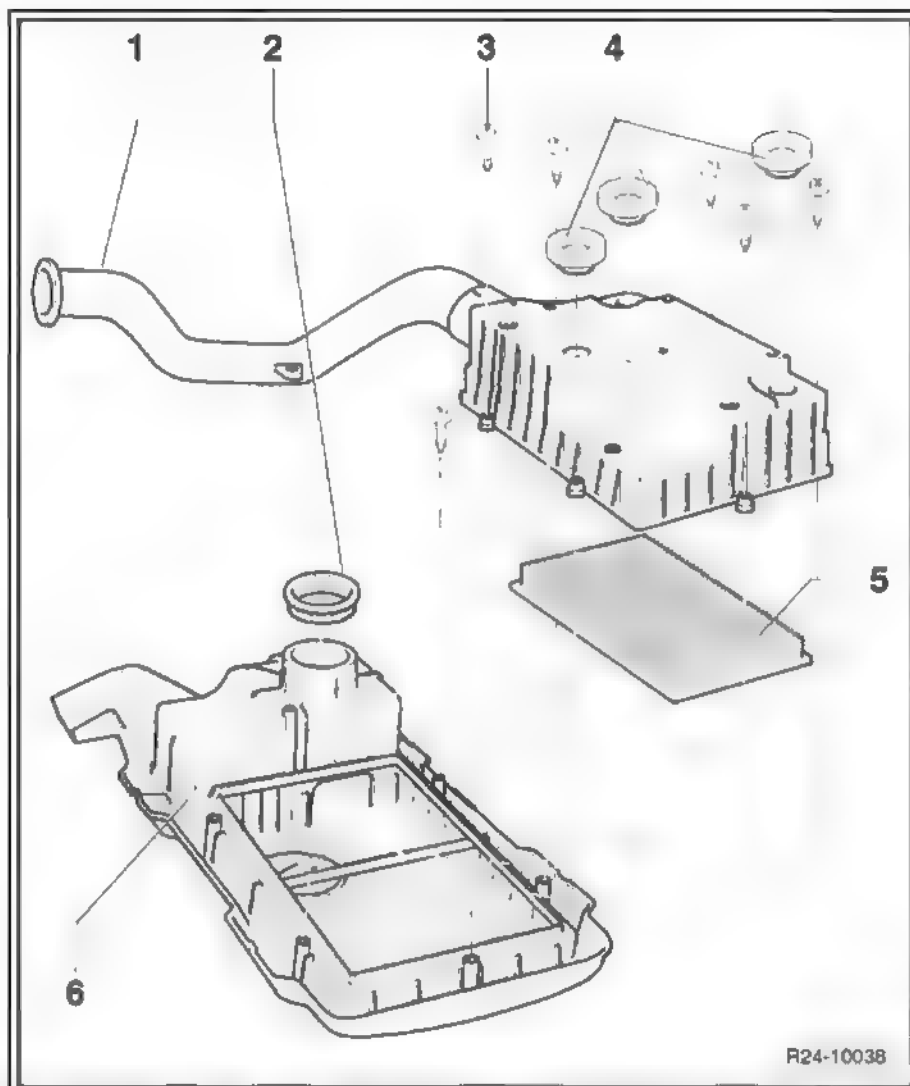
### 3 - Bolt

- ❑ Screw for filter attachment (top and bottom sections), follow the sequence and recommended torque engraved on the bottom of the filter.

### 4 - Rubber bearing

### 5 - Filtering element

### 6 - Underside of the vehicle



## 1.7 Air filter assembly - remove and install

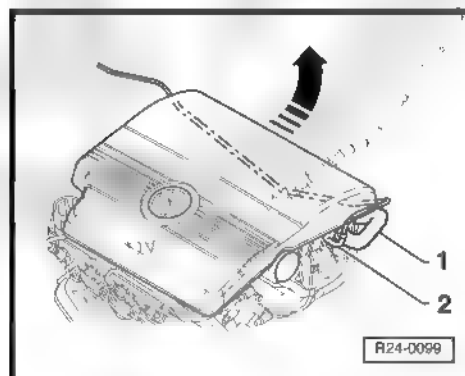
### 1.7.1 Removal

For (AQZ, BJE, BNX) engines

- Remove the crankcase venting hose - 1- from the air filter case.
- Remove breather hose of Cold start valve - N17- -2- from air filter housing

For (CCNA, CPBA) engines

- Remove the crankcase venting hose from the air filter case.



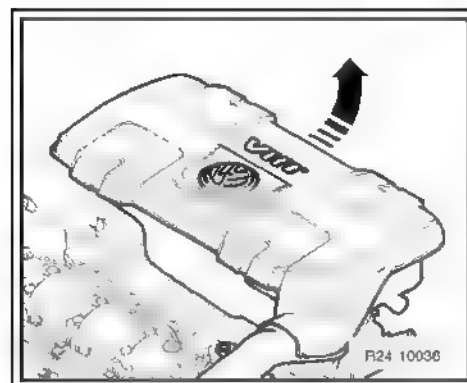




- Remove securing bolt from intake connecting pipe (CCNA and CPBA engines).
- Remove breather hose of Cold start valve - N17- from air filter housing (CCNA Engine).

Continuation:

- Remove first the air filter case from rear supports and from the Throttle valve control unit - J338- then from front supports



## 1.7.2 Installation

- The air filter case assembly is initially carried out by fitting the accelerator butterfly valve command unit nozzle - J338- , side supports, and then the front supports.
- Apply neutral soap or coolant additive to the fastening bearings and to the Accelerator butterfly valve control unit - J338- at the moment of the installation.
- Install fastening screw to nozzle, applying a torque of 1.5 Nm (CCNA and CPBA engine).



### Note

- ◆ *To fasten the filter upper part to the filter base as well as the air air intake hoses and the Intake manifold pressure sensor - G42- and Air intake temperature sensor - G71- , serial self-locking screws are used. If these bolts are unscrewed or fastened by an electric screwdriver, threads may be damaged.*
- ◆ *For that reason, using a power screwdriver is only allowed when:*
- ◆ *the drill speed is 200 rpm at most,*
- ◆ *a torque of 3 Nm at most is adjusted.*
- ◆ *For CCNA engines, the recommended torque and sequence for filter screws are printed on the filter housing.*

## 1.8 Safety measures



### WARNING

*The fuel system is under pressure. Before loosening hose connections or opening checking junction, place a cloth around them. Then, eliminate the pressure, by carefully removing the hose and loosening the closing screw.*

To avoid personal injuries and/or injection and ignition system damage, observe the following

- ◆ For safety reasons, fuse 33 must be removed from the fuse box before opening the fuel system.
- ◆ Do not touch or remove the ignition cables while the engine is running or when the engine is starting.
- ◆ Only connect or disconnect the injection and ignition system cables (and measuring device cables) with the ignition switched off



#### WARNING

*Whilst working within the engine compartment in particular, due to the limited space available, take the following into account:*

- ◆ *All hoses (e.g. fuel, hydraulics, activated charcoal filter system, cooling system and cooling gas, brake fluid, vacuum) and electric cables must be restored to their original positions.*
- ◆ *Allow easy access to all the moving or hot parts.*

If during a test drive it is necessary to use test and measuring equipment, observe the following.

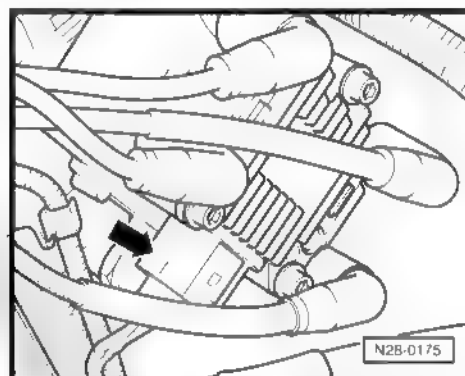
- ◆ Always install test and measuring equipment on the back seat and have them operated by a second mechanic.

If test and measuring equipment are operated from the passenger seat, the person seated there may be injured should the airbag activate in case of accident.

- ◆ If the engine is to be turned over at starting speed, without starting:
  - Disconnect the 4-pole connector from the Ignition transformer - N152- -arrow- .

CCNA engine to 07/2009

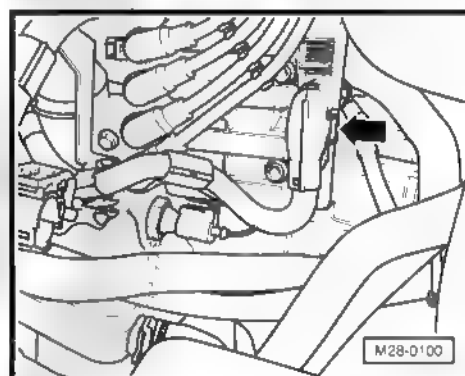
CCNA engine as of 08/2009



- Disconnect the 6-pole connector from the Ignition transformer - N152- -arrow- .

CPBA Engine

- Disconnect connectors from Ignition coil with final power stage .



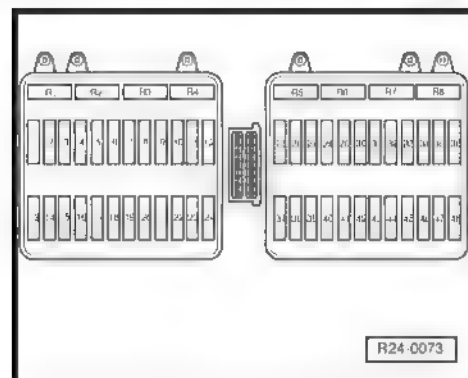


- Remove fuse 33 from fuse box.



#### Note

When fuse 33 is removed, power supply to the injector valves is interrupted.



## 1.9 Cleaning rules

For cleaning, carefully observe these "5 rules" when working on the fuel supply/injection system:

- ◆ Thoroughly clean the connections and surrounding areas before disconnecting them.
- ◆ Place parts on clean surface and cover them. Use lint-free cloths!
- ◆ If the repair work will not be performed immediately, exposed components must be covered or carefully preserved.
- ◆ Install clean components only. Remove spare parts from packaging just prior to installation. Do not install components that have been stored outside of packaging (i.e. inside a tool box, etc.).
- ◆ With the system open: If possible, avoid using compressed air. Do not move vehicle, if possible.

## 1.10 Technical Data

Engine codes	BJE/AOZ	BNX	CCNA	CPBA
Idle speed check				
Idle speed rotation <sup>11)</sup>	rpm	without A/C= 770...870 with A/C= 790...890 <sup>10)</sup>	without A/C= 850...950 with A/C= 900...1000 <sup>10)</sup>	without A/C= 800...900 with A/C= 850...950 <sup>10)</sup>
Engine control unit - J623- <sup>12)</sup>				
System	4BV Marelli	4BV Marelli	4GV Marelli	ME17.5.20 Bosch
Replacement part number	⇒ Replacement part CD	⇒ Replacement part CD	⇒ Replacement part CD	⇒ ETKA
Speed limit	rpm	From approximately 6800	From approximately 6800	From approximately 6800

A/C = air conditioning

10) Non-adjustable.

11) Non-adjustable.

12) Replace the Engine control unit - J623- ➔ [page 181](#).

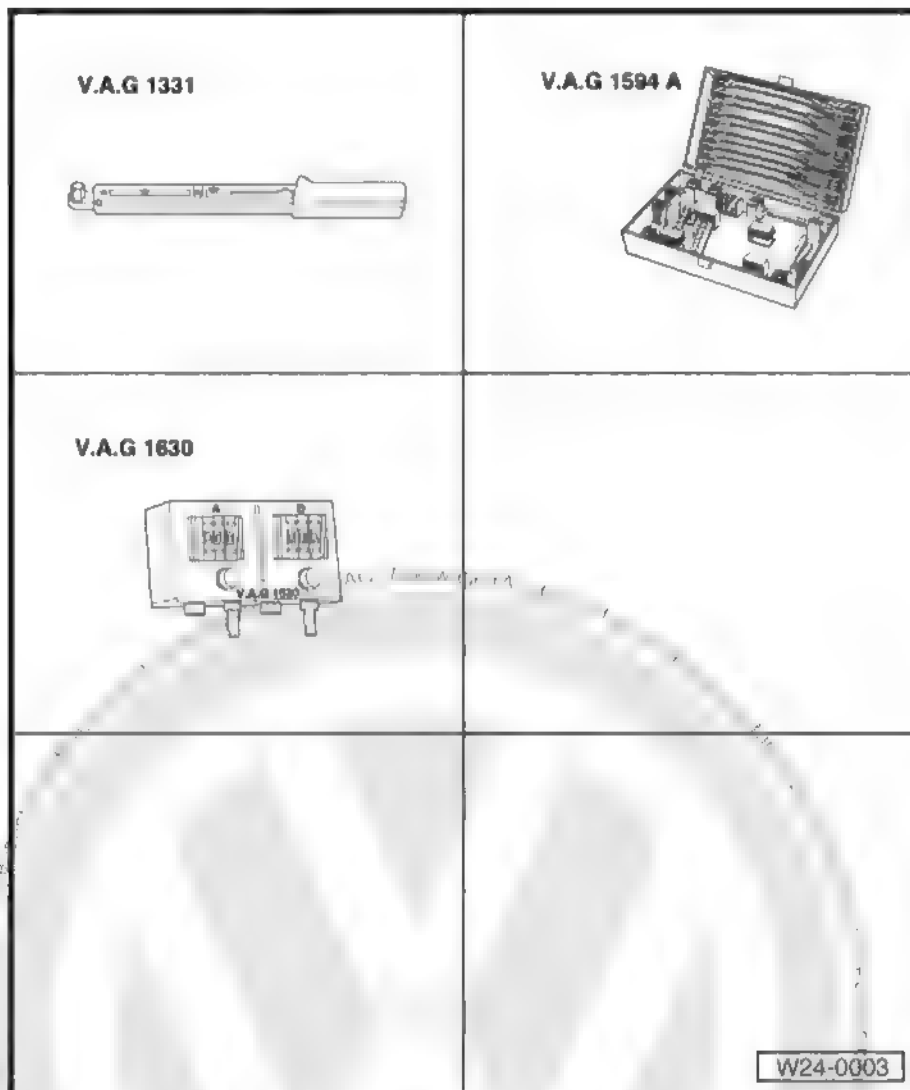


## 2 Component checks

### 2.1 Injection valves - check

Examine the sealant and the shape of the jet

Special tools and workshop  
equipment required



- ◆ Torque wrench - 5 to 50 Nm ( 1/2" drive) - VAG 1331-
- ◆ Auxiliary measuring cable set - VAG 1594C-
- ◆ Digital potentiometer (included in VAG 1594C) - VAG 1630-
- ◆ Graduated container

#### Test conditions

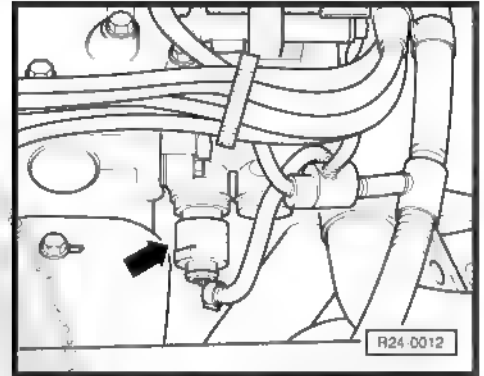
- The fuel pressure must be correct, check [page 176](#) .

#### Test sequence

- Remove air filter set ➔ [page 170](#) .

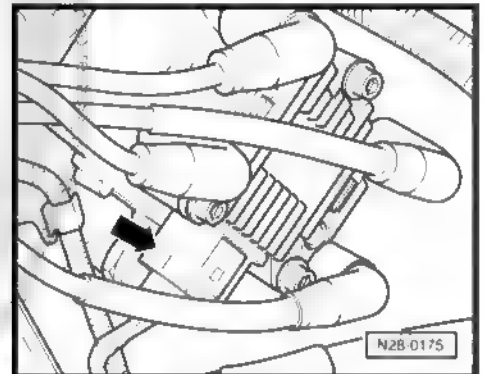


- Disconnect the connector from the Coolant temperature sensor - G62- -arrow-
- Disconnect the 4-pole connector from the Ignition transformer - N152- -arrow-



CCNA engine to 07/2009

CCNA engine as of 08/2009

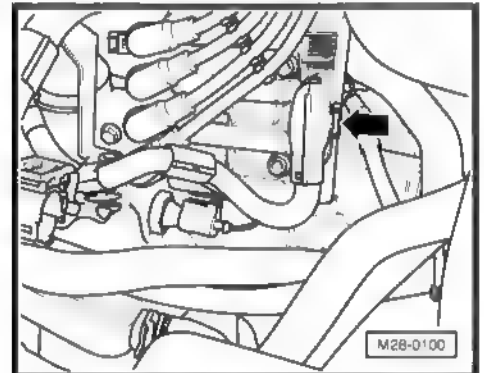


- Disconnect the 6-pole connector from the Ignition transformer - N152- -arrow-

CPBA Engine

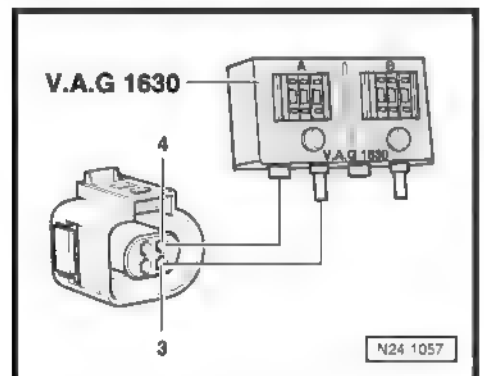
- Remove connectors from Ignition coil with final power stage .

AQZ, BJE and BNX engines



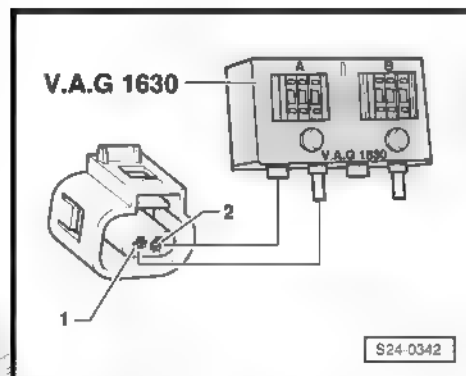
- Connect the Digital potentiometer (included at VAG 1594 C) - VAG 1630- with the Auxiliary measuring cable set - VAG 1594A- to connector contacts 3 + 4 and adjust the connected side to 15 kΩ.

CCNA and CPBA engines





- Connect the Digital potentiometer (included with VAG 1594C ) - VAG 1630- using the Auxiliary measuring cable set - VAG 1594C- to the connector contacts -1- + -2- and adjust the connected side to 15 kΩ.
- Disconnect the injection valve harness in the fuel distributor.
- Remove the fuel distributor with all injection valves from engine cylinder head (fuel pipes remain connected).



- Keep a small graduated container under the injection valve to be tested and remove the connectors from the remaining injection valves.

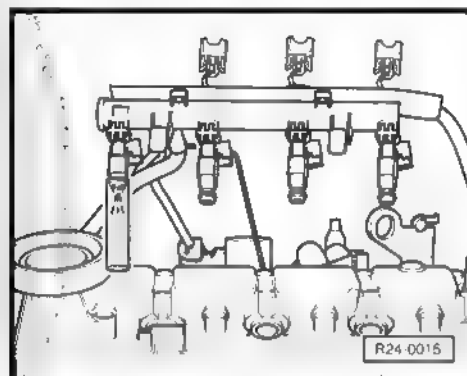
A second person must operate the Starter - B- . The injection valve should inject in pulses.

- Repeat test on the other injection valves. Ensure that only the injection valve being tested is connected.

Then check the injector valve sealant. Fuel loss cannot exceed 2 drops a minute.

If fuel loss is greater:

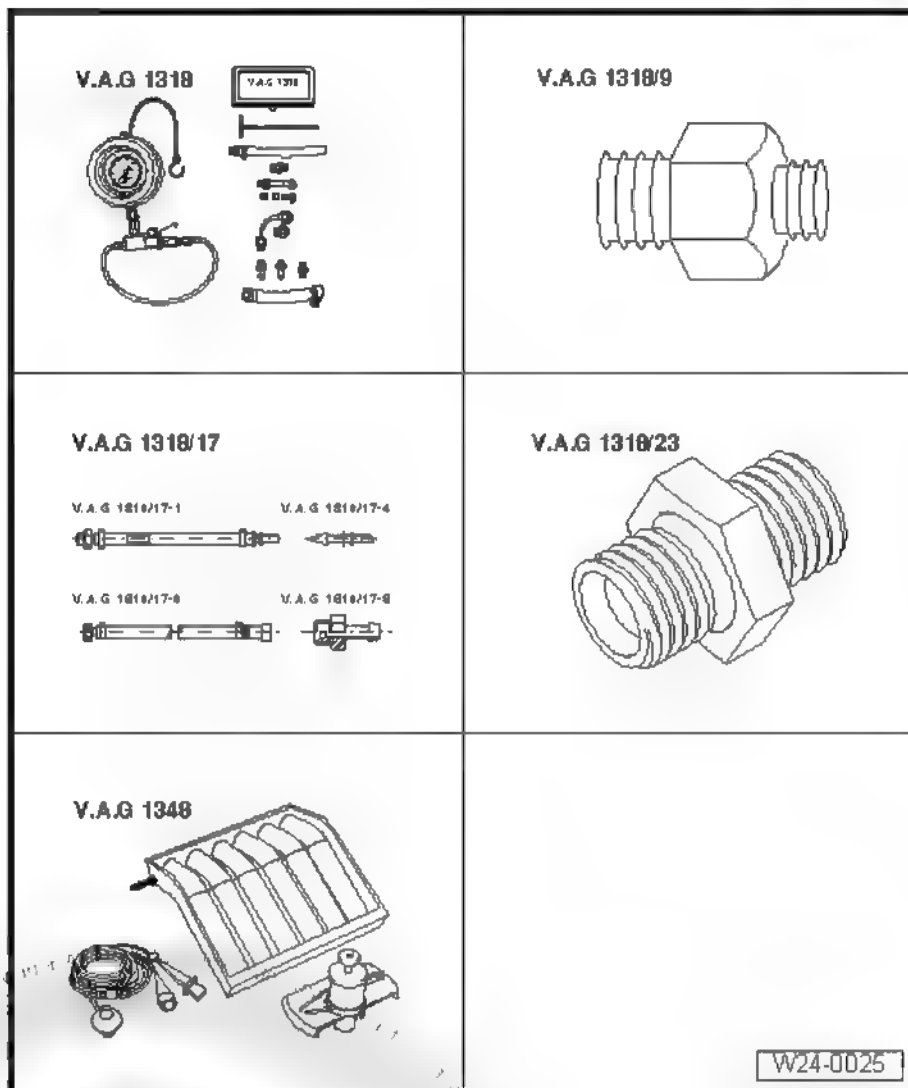
- Turn the ignition off.
- Replace defective injection valve.
- The injection valve is installed in the reverse order, observing the following:
  - ◆ Rings on all injection valves should be replaced and thoroughly lubricated with clean engine oil.
  - ◆ Place the injection valves vertically and in their proper position in the fuel distributor and fasten them with safety clips.
  - ◆ Install the fuel distributor with the injection valves on the engine cylinder head and press down uniformly.



## 2.2 Residual pressure and fuel pressure regulator - check



Special tools and workshop equipment required



- ◆ Pressure gauge - VAG 1318-
- ◆ Adapter - VAG 1318/1-
- ◆ Adapter - VAG 1318/17-
- ◆ Adapter - VAG 1318/23-
- ◆ Adapting cable - VAG 1348/3A-



Note

- ◆ The fuel pressure regulator adjusts the fuel pressure to approx. (3.5 Bar for BJE/AQZ engines) and (4.2 Bar for BNX/CCNA/CPBA engines).
- ◆ The fuel pressure regulator is in the Fuel pump (pre-supply pump) G6-.

Test sequence

- Remove the fuse box lid



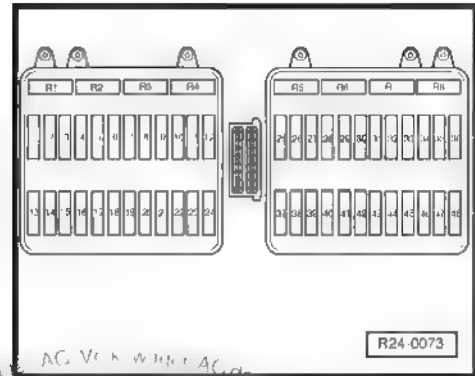
- Remove fuse 33 from the ( Fuel pump (pre-supply pump) - G6- ) fuse box



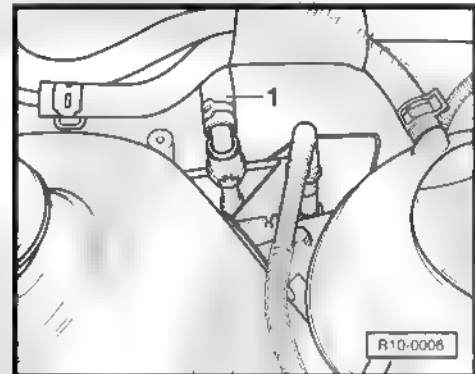
#### WARNING

*The fuel system is under pressure. Before loosening hose connections or opening checking junction, place a cloth around them. Then, eliminate the pressure, by carefully removing the hose and loosening the closing screw.*

- Disconnect fuel supply pipes connection -1- and clean spilled fuel with a cloth. (AQZ engine).

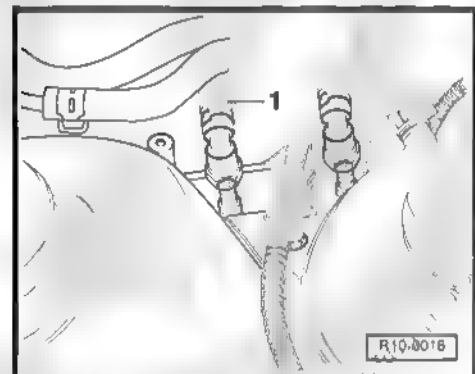


- Disconnect fuel supply pipes connection -1- and clean spilled fuel with a cloth. (BJE, BNX, CCNA and CPBA engines).



#### Note

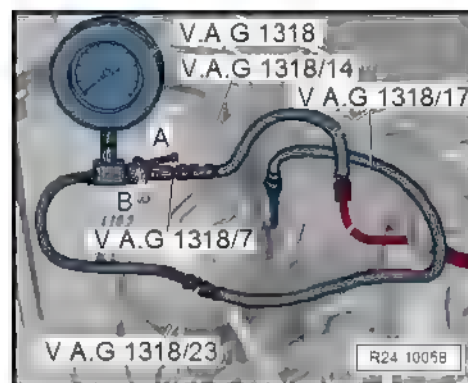
*To unlock the fuel lines, press the safety ring.*







- Connect the Pressure gauge - VAG 1318- with the Adapter set - VAG 1318/23- and the Adapter - VAG 1318/17- to the supply pipes
- Connect the Pressure gauge - VAG 1318- with the Adapter set - VAG 1318/7- , Adapter - VAG 1318/14- , Adapter - VAG 1318/17- to the fuel rail hose
- Open the Pressure gauge valve - VAG 1318- . The valve will point towards flow direction-A-.
- Put fuse 33 of Fuel pump (pre-supply pump) - G6- back in the fuse box
- Start the engine and keep it idling.
- Measure fuel pressure. Theoretical value:
  - ◆ Engine (BJE and AQZ) ⇒ approx. 3.5 bar
  - ◆ Engine (BNX, CCNA and CPBA) ⇒ approx. 4.2 bar



If the theoretical value is not obtained:

- Turn the ignition off.
- Check that the Fuel pump (pre-supply pump) - G6- is generating and maintaining this pressure ⇒ [page 141](#) .
- Check fuel pressure regulator ⇒ [page 180](#)

If the theoretical values is obtained:

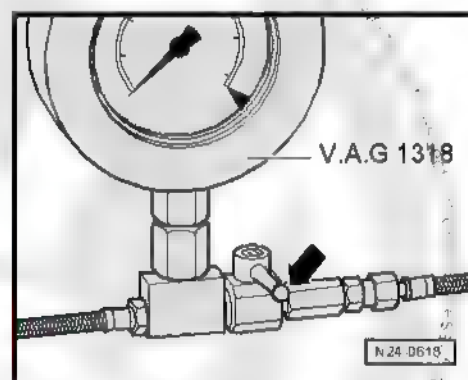
- Turn the ignition off.
- Check sealing and retention pressure, whilst keeping an eye on the pressure drop on the Pressure gauge - VAG 1318- . After 10 minutes, a minimum pressure of 2.5 bar must be obtained.

If retaining pressure drops below 2.5 bar:

- Start the engine and keep it idling.
- When the pressure is reached, turn the ignition off, while closing the Pressure gauge - VAG 1318- valve (handle in transverse position to the flow direction -arrow-).
- Check the pressure drop on the Pressure gauge - VAG 1318- .

If the pressure drops again:

- Check the Fuel pump (pre-supply pump) - G6- ⇒ [page 148](#) retention valve.
- Check fuel pressure regulator ⇒ [page 180](#) .



#### WARNING

*The fuel system is under pressure. Before loosening hose connections or opening checking junction, place a cloth around them. Then, eliminate the pressure, by carefully removing the hose and loosening the closing screw.*

If the pressure does not drop:

- Check hose connections, fuel distributor rings and injection valves for leaks.
- Check the Pressure gauge - VAG 1318- for leaks.



## 2.2.1 Fuel pressure regulator - check

### Test conditions

- Retention valve for Fuel pump (pre-supply pump) - G6- OK- check ➔ [page 148](#) .

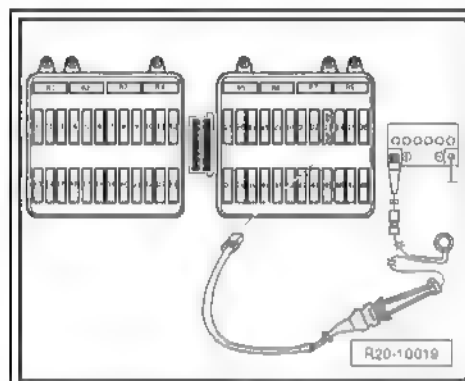
### Test sequence

- Turn the ignition off.
- Remove the fuse box lid.
- Remove fuse 33 of ( Fuel pump (pre-supply pump) - G6- ) from fuse box.
- Connect the Remote control - VAG 1348/3A- and Adapter cable - VAG 1348/3-2- to the lower contact of fuse 33 (33b position) of the fuel system pressurisation pump - G6- activation and to the positive terminal of the Battery - A- (+).



### WARNING

*The fuel system is under pressure. Before loosening hose connections or opening checking junction, place a cloth around them. Next, eliminate pressure by carefully removing the hose.*



- Disconnect fuel supply pipes -1- from fuel filter outlet.
- return lines -2- (blue), keep connected.
- Supply pipes -3- (black), keep connected.
- Fuel supply pipes (from filter outlet to engine) -4- connect to Pressure gauge - VAG 1318- .



### Note

*To disconnect the fuel tubing, press the safety ring key.*

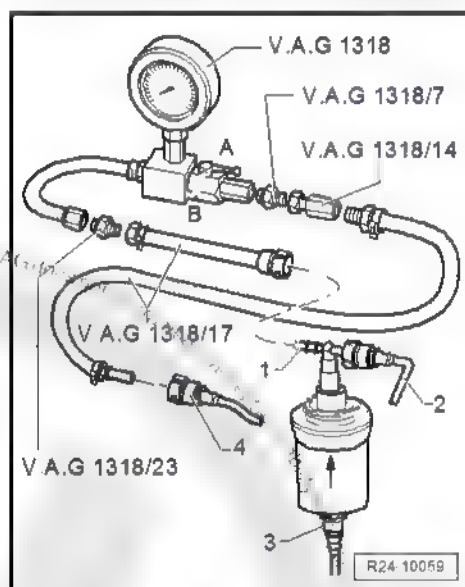
- Connect the Pressure gauge - VAG 1318- with Adapting set - VAG 1318/23- and Adapter - VAG 1318/17- to the fuel filter outlet -1-.
- Close the valve on the Pressure gauge - VAG 1318- (valve transverse to the flow direction - position -B-).
- Activate the Remote control - VAG 1348/3A- for approximately 10 seconds to fill the fuel tank and generate system pressure of approximately:
  - Engine (BJE/AQZ) ⇒ approx. 3.5 bar
  - Engine (BNX, CCNA and CPBA) ⇒ approx. 4.2 bar
- Check the pressure drop on the Pressure gauge - VAG 1318- . After 10 minutes, the pressure should not have dropped below 2.5 bar

If the pressure drops further:

- Check line connections for leaks.

If no flaw is found in the pipes:

- Replace fuel pressure regulator.





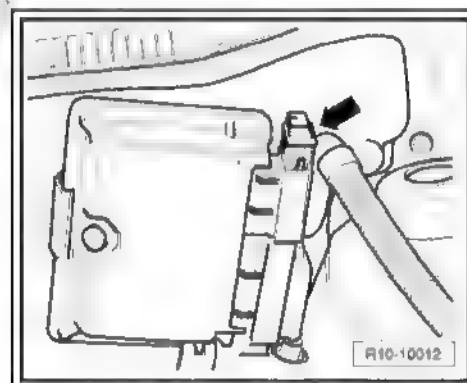
## Engine control unit - J623-

### 3.1 Engine control unit - J623- - remove and install

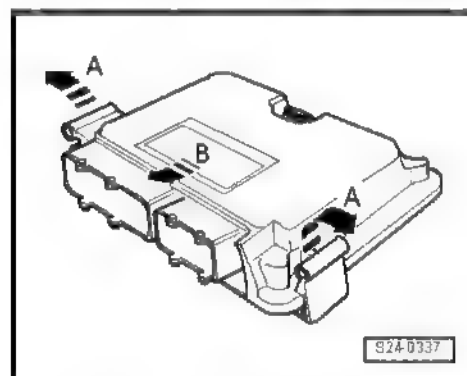
- Before removing the Engine control unit - J623- first check the Engine control unit - J623- and also the coding of the previous Engine control unit - J623- → [page 183](#) .

#### 3.1.1 Removal

- Turn the ignition off.
- Disconnect the fitting connector -arrow- from Engine control unit - J623- and remove it.



- Press clips -arrows- outwards and pull the Engine control unit - J623- sideways.



#### 3.1.2 Installation

- Place the new Engine control unit - J623- and press it to the left.
- Connect the connector and lock.
- Adjust the Engine control unit - J623- → [page 182](#) .
- Refer to the event memory of the new Engine control unit - J623- and, if necessary, erase the event memory → [page 183](#) .
- Carry out a test cycle.
- Check the fault memory in the Engine control unit - J623- again

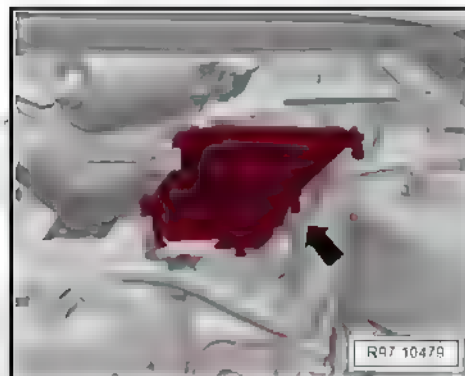
### 3.2 Engine control unit - J623- (CPBA engine) - remove and install

- Before removing the Engine control unit - J623- first check the Engine control unit - J623- and also the coding of the previous Engine control unit - J623- → [page 183](#) .



### 3.2.1 Removal

- Turn the ignition off.
- Push the Engine control unit - J623- to the right and remove it.
- Unlock the connectors from the Engine control unit - J623- and disconnect them.



### 3.2.2 Installation

- Connect the connector and lock.
- Install the Engine control unit - J623- and press it.
- Adjust the Engine control unit - J623- => [page 182](#) .
- Refer to the event memory of the new Engine control unit - J623- and, if necessary, erase the event memory => [page 183](#) .
- Carry out a test cycle.
- Check again the [page 183](#) event memory.

### 3.3 Adjust components

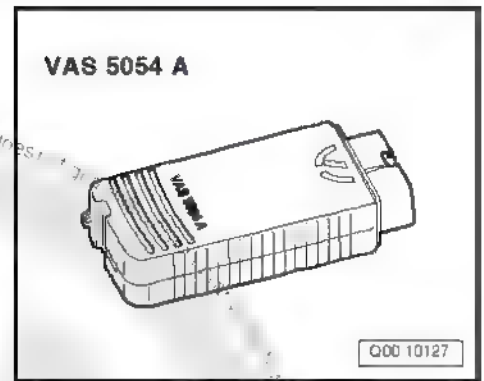
Special tools and workshop equipment required

- ◆ "Startline" vehicular diagnostics laptop - VAS 6150B-





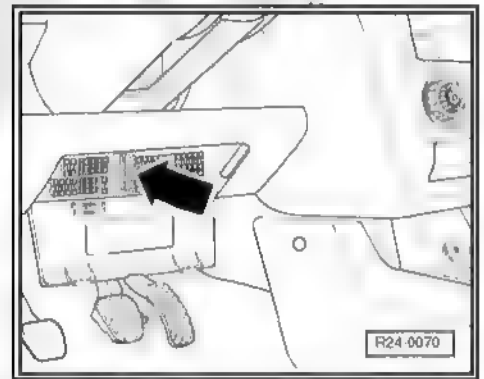
◆ Wireless diagnostic connector - VAS 5054 A-



Operation sequence

- Connect the Vehicle diagnostic, testing and information system as follows:
- Place the connector of Diagnostic cable to the diagnosis connection.

Select, in the Vehicle diagnostic, testing and information system the "Assisted troubleshooting".

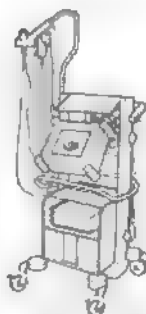


### 3.4 Check Engine control unit - J623- fault memory and clear it

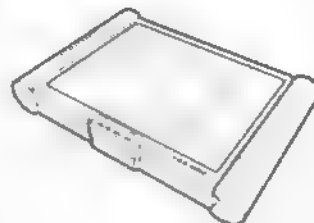


**Special tools and workshop  
equipment required**

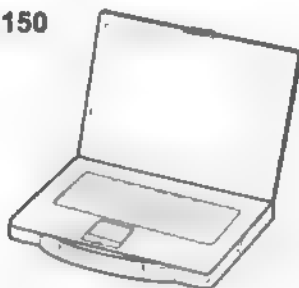
**VAS 5051**



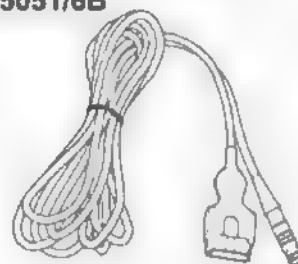
**VAS 5052**



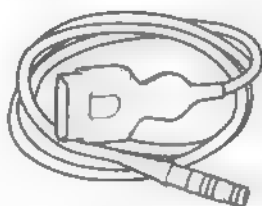
**VAS 6150**



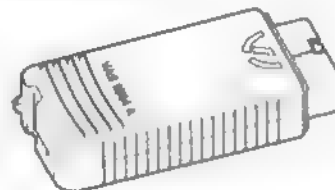
**VAS 5051/6B**



**VAS 5052/3A**



**VAS 5054 A**



Q97-10001

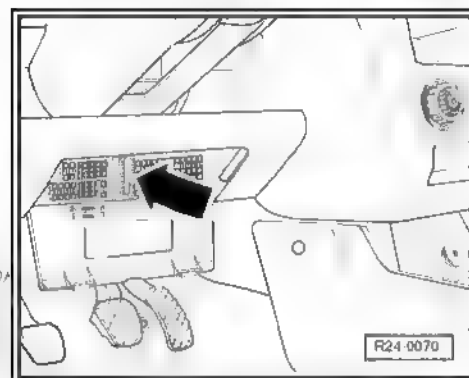
- ◆ Vehicle diagnostic, testing and information system - VAS 5051-
- ◆ Vehicle diagnostic, testing and information system - VAS 5052-
- ◆ Vehicle diagnostic, testing and information system - VAS 6150-
- ◆ Diagnostic cable - VAS 5051/6B-
- ◆ Diagnostic cable - VAS 5052/3A-
- ◆ Wireless diagnostic connector - VAS 5054/A-

**Operation sequence**

- Connect the Vehicle diagnostic, testing and information system as follows



- Connect the Diagnostic cable
- Start the engine and keep it idling





## 4 READINESS code

### Function

The READINESS code is an eight-digit code indicating the status of relevant diagnoses for exhaust gases.

Whenever a system diagnostics (e.g. secondary air system) is successfully conducted, the corresponding digit in the digital code changes its status.

Diagnosis is performed at regular intervals during normal vehicle operation. After doing repairs on an exhaust gas system, it is advisable to generate the READINESS code, to ensure that all systems are functioning properly. If a fault is identified during diagnosis, it will be saved in the event memory.

The READINESS code is deleted every time the event memory is deleted or when there is an interruption of the power supply to the Engine control unit J623 - .

### 4.1 Creating and Interpreting the READINESS code

⇒ Vehicle diagnostic tester





## 26 – Exhaust system

### 1 Exhaust system components - remove and install



#### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque.*



#### Note

- ◆ *After finishing installation works on the exhaust system, check that there is no tension and the distance from the body is sufficient. If necessary, loosen double clamp(s) and separate silencer from the exhaust manifold so they remain, along their whole lengths, at an enough distance from the body, and the supports sustain the weight evenly.*
- ◆ *Replace the self-locking nuts.*

#### 1.1 Intake manifold, front exhaust tube with catalytic converter, intermediate silencer and installation parts



#### WARNING

*Always replace self-locking nuts and bolts subjected to angular torque.*

BJE and AQZ engines



1 - Heat shield

2 - 12 Nm

3 - Exhaust manifold

- ☐ For removal, remove heat deflector and loosen front pipe.

4 - Self-locking nut

- ☐ 40 Nm
- ☐ Replace after each removal.

5 - Sealing gasket

- ☐ Replace.

6 - Self-locking nut

- ☐ 25 Nm
- ☐ Replace after each removal.

7 - Double clamp

- ☐ Replace after each removal.

8 - To rear silencer

9 - Self-locking nut

- ☐ 40 Nm.

10 - Front exhaust pipe with catalytic converter and centre silencer

11 - Sustaining handle

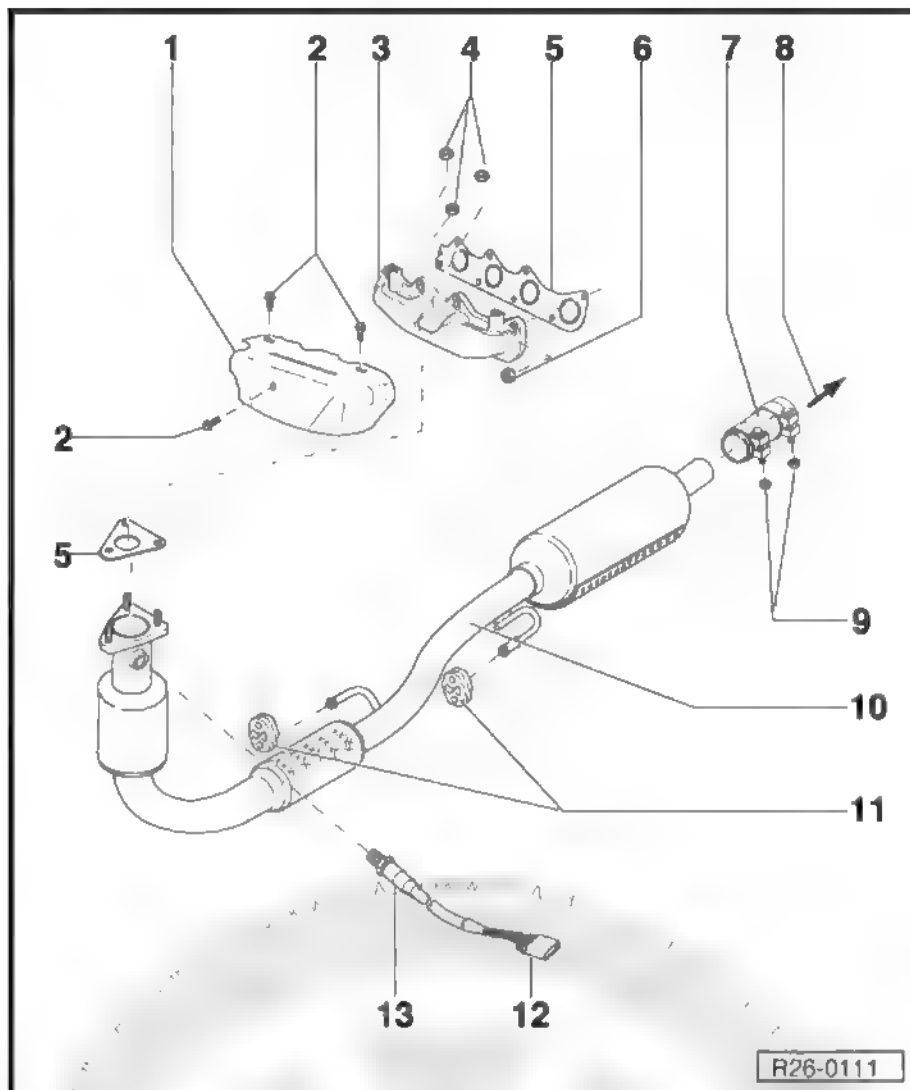
- ☐ Replace when damaged.

12 - Connector

- ☐ Black, 4 poles.
- ☐ For the Lambda probe - G39- before the catalytic converter and Lambda probe heating - Z19-.

13 - Lambda probe - G39- before the catalytic converter

- ☐ 50 Nm
- ☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- ; High-temperature paste - G 052 112 A3- cannot reach the grooves on the body of Lambda probe - G39-.
- ☐ Remove and install with the Set of sockets for Lambda probe - 3337-.
- ☐ Remove sealing rind in case of leaks and replace it.



BNX, CCNA and CPBA engines



# 1 - Heat shield

- ☐ For removal, remove the Lambda probe - G39-

## 2 - 12 Nm

# 3 - Exhaust manifold

- ☐ For removal, remove heat deflector and loosen front exhaust tube.
- ☐ Tightening torque for self-locking fastening nuts = 25 Nm.
- ☐ Replace after removing of self-locking nuts.

## 4 - Lambda probe - G39- before the catalytic converter

- ☐ 50 Nm
- ☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- ; High-temperature paste - G 052 112 A3- cannot reach the grooves on the body of the probe.
- ☐ Remove and install with the Set of sockets for Lambda probe - 3337- .
- ☐ Remove sealing rind in case of leaks and replace it.

## 5 - Sealing gasket

- ☐ Replace.

## 6 - Catalytic converter

- ☐ Integrated to exhaust manifold.

## 7 - Double clamp

## 8 - To rear silencer

## 9 - Self-locking nut

- ☐ 23 Nm.
- ☐ Replace after removal.

## 10 - Front exhaust manifold with intermediate silencer

## 11 - Intermediate muffler

## 12 - Sustaining handle

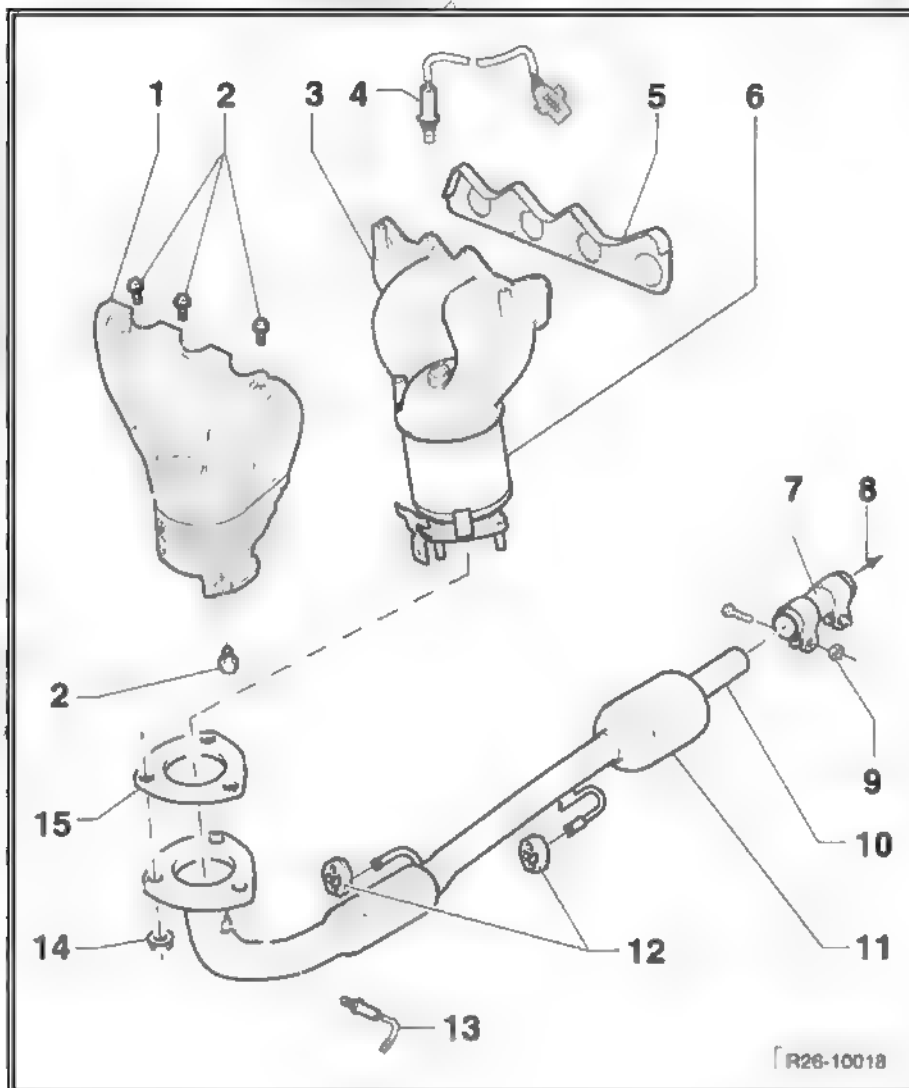
- ☐ Replace when damaged
- ☐ Remove with a Hook - VW 5812- .

## 13 - Lambda probe after the catalytic converter - G130- , 50 Nm

- ☐ Only for the Argentina and Novo Fox versions.
- ☐ Lubricate only the thread with High-temperature paste - G 052 112 A3- , High-temperature paste - G 052 112 A3- cannot reach the grooves on the body of the probe.
- ☐ Remove and install with the Set of sockets for Lambda probe - 3337- .
- ☐ Remove sealing rind in case of leaks and replace it.

## 14 - Self-locking nut

- ☐ 40 Nm





- ☐ Replace after removal.

#### 15 - Sealing gasket

- ☐ Replace

## 1.2 Rear muffler with supports

### 1 - Rear exhaust pipe

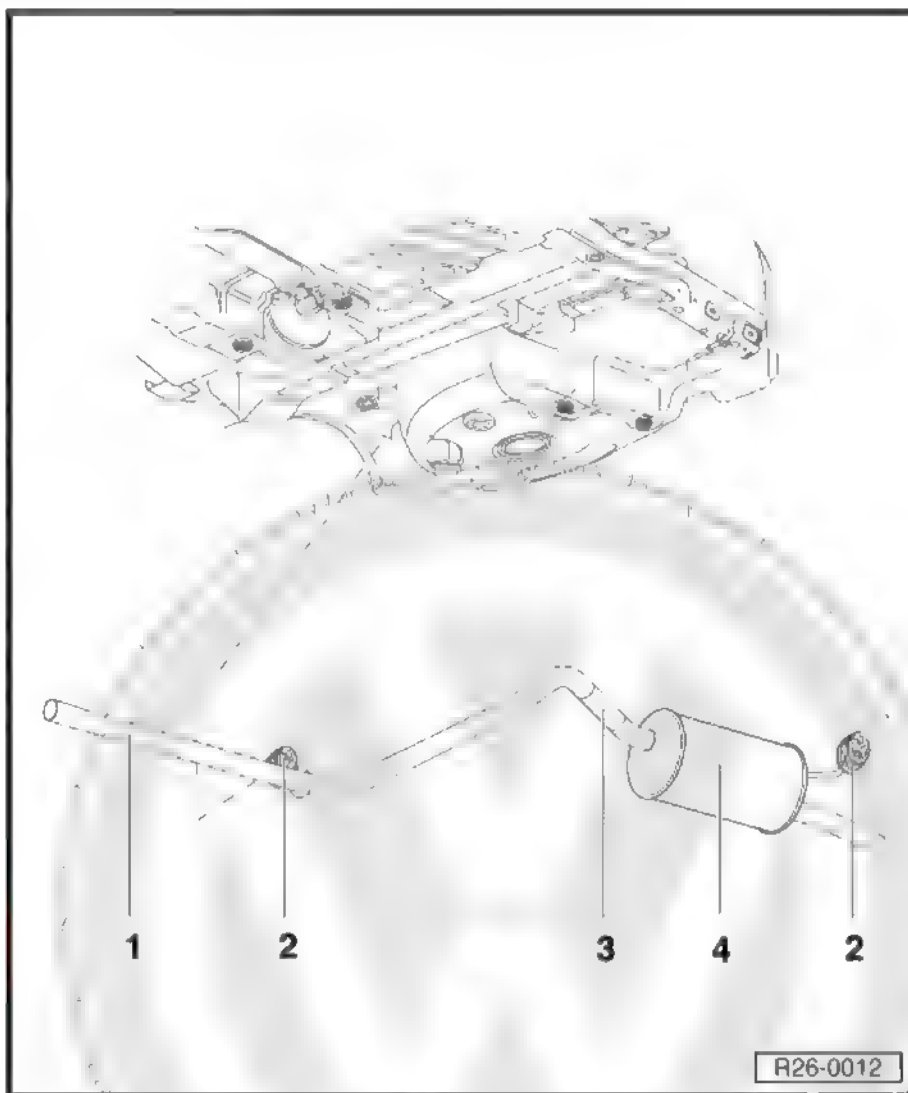
### 2 - Sustaining handle

- ☐ Replace when damaged.
- ☐ Remove with a Hook - VW 5812-.

### 3 - Separation point

- ☐ Identified by a cavity on the connecting pipe.
- ☐ As standard items, the rear muffler with exhaust tube as one part are mounted. For repair, the rear muffler is supplied individually with one double clamp.
- ☐ Disconnect the connection pipe at the separation point with the Pneumatic Saw - EQ 7415- , Pneumatic Saw - VAG 1523A- or Tube Cutter - VAS 6254- for example, in right angle  
⇒ [page 190](#)

### 4 - Rear muffler



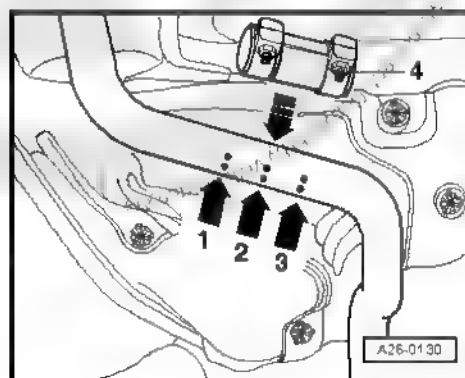
#### Separation point on the exhaust tube



#### WARNING

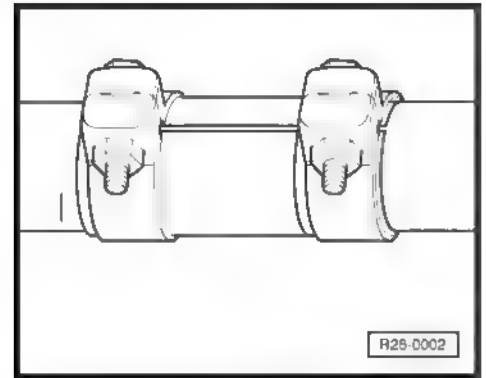
*Wear protection goggles and clothing to prevent from injuries caused by metallic filings.*

- Cut exhaust tube in right angle on the -arrow 2-separation point.
- Place double clamp for repair -4- during installation, on lateral identifications -arrows 1 and 3-. Tightening torque: 23 Nm.





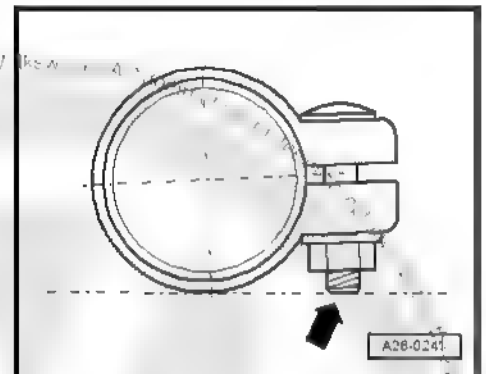
## Clamp mounting position



- Install the double clamp so that the screw tip does not come out beyond the lower edge of the double clamp itself.

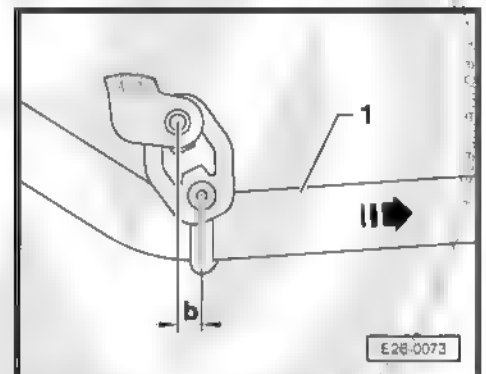
### Operation sequence:

- Apply Sealant for exhaust connections - D 004 500- ➔ See Chemicals Manual. on the junctions; then, assemble the sleeve and clamps on the exhaust tube.
- Align the sleeve so that the junction is exactly in the centre of the sleeve.



### Installation position

- Distance -b- of 6 ... 10 mm indicates the displacement between the body's bearing and on the exhaust tube of rear silencer, which must be observed upon installation.
- The -arrow- indicates the front of the vehicle.





## 28 – Ignition system

### 1 Ignition system

#### 1.1 General instructions regarding the ignition system

- ◆ This chapter addresses especially ignition system related components. Other components of the injection system ⇒ [page 155](#) .
- ◆ A minimum voltage of 11.5V is necessary for the perfect operation of electrical components.
- ◆ In some tests, the Engine control unit - J623- may detect and record a fault. Accordingly, once all tests and repairs are complete, check the event memory and erase it if necessary ⇒ [page 183](#) .
- ◆ If after troubleshooting, repair and component checking, the engine starts for a moment and stops, the immobilizer may be blocking the Engine control unit - J623- . In this case, check the event memory and, if necessary, adjust the Engine control unit - J623- ⇒ [page 182](#) .

Safety measures ⇒ [page 196](#) .

Checking data, spark plugs ⇒ [page 197](#) .

#### 1.2 Ignition system components - remove and install



Note

Engine control unit - J623- with connectors ⇒ [Item 8 \(page 157\)](#) .

##### 1.2.1 CCNA engine to 07/2009



**1 - Connector**

- ☐ Black, 4 poles.
- ☐ To the Ignition transformer - N152-.

**2 - Ignition transformer - N152-**

- ☐ Installation location  
→ [page 162](#) .
- ☐ With codes for spark  
plug cables:

◆ A = cylinder 1

◆ B = cylinder 3

◆ C = cylinder 2

◆ D = cylinder 4

3 - 10 Nm

**4 - Connector**

- ☐ Black, 2 poles.
- ☐ For Knock sensor 1 -  
G61- .
- ☐ Gold plated contacts for  
Knock sensor 1 - G61-  
and connector.

**5 - Knock sensor 1 - G61-**

- ☐ Installation location  
⇒ [page 162](#) .
- ☐ Gold plated contacts for  
Knock sensor 1 - G61-  
and connector.

6 - 20 Nm

- ☐ Tightening the torque in-  
fluences the operation  
of the Knock Sensor 1 -  
G61- .

**7 - Connector**

- ☐ Black, 3 poles.
- ☐ To Hall Sensor - G40- .
- ☐ Gold plated connector contacts.

**8 - Hall Sender - G40-**

- ☐ Installation location ⇒ [page 162](#) .

**9 - Washer**

- ☐ Replace when damaged.

**10 - Spark plugs - Q-**

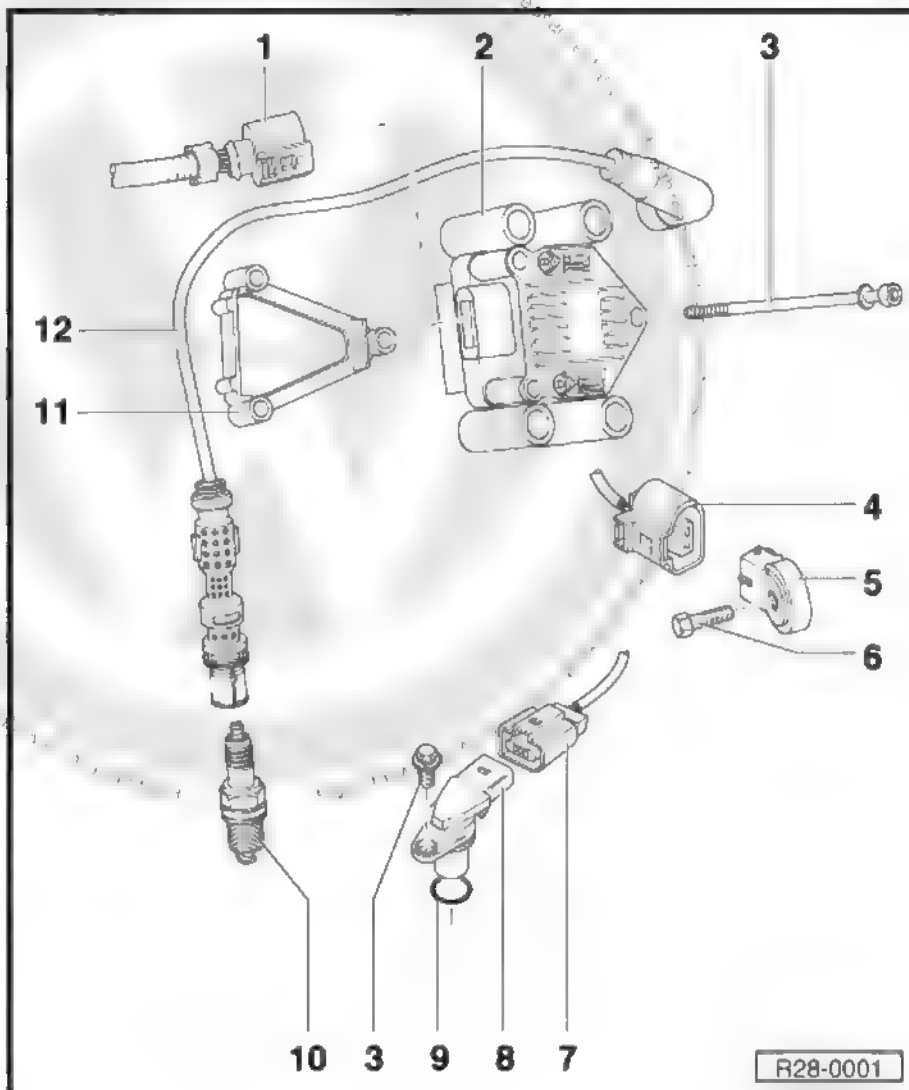
- ☐ 30 Nm
- ☐ Remove and install with Spark plug wrench - 3122B- .
- ☐ Type and inter-electrode gap → [page 197](#) .

**11 - Support**

- ☐ To the Ignition transformer - N152- .

**12 - Ignition cable**

- ☐ With interference suppression and spark plug connector.
- ☐ Resistance 4 8...7.2 kΩ.





## 1.2.2 CCNA engine as of 08/2009

### 1 - Ignition cable

- ☐ With interference suppression and spark plug connector.
- ☐ Resistance 4.8...7.2 kΩ.

### 2 - Ignition transformer - N152-

- ☐ Installation location ⇒ [page 162](#) .
- ☐ Ignition transformer - N152- 4 X 1.
- ☐ With codes for Spark plug - Q- cables:

◆ A = cylinder 4

◆ B = cylinder 3

◆ C = cylinder 2

◆ D = cylinder 1

3 - 10 Nm

### 4 - Connector

- ☐ Black, 6 poles.
- ☐ To the Ignition transformer - N152- .

### 5 - Connector

- ☐ Black, 2 poles.
- ☐ For Knock sensor 1 - G61- .
- ☐ Gold plated contacts for Knock sensor 1 - G61- and connector.

### 6 - Knock sensor 1 - G61-

- ☐ Installation location ⇒ [page 162](#) .
- ☐ Gold plated contacts for Knock sensor 1 - G61- and connector.

7 - 20 Nm

- ☐ Tightening the torque influences the operation of the Knock Sensor 1 - G61- .

### 8 - Spark plugs - Q-

- ☐ 30 Nm
- ☐ Remove and install with Spark plug wrench - 3122B- .
- ☐ Type and inter-electrode gap ⇒ [page 197](#) .

### 9 - Seal

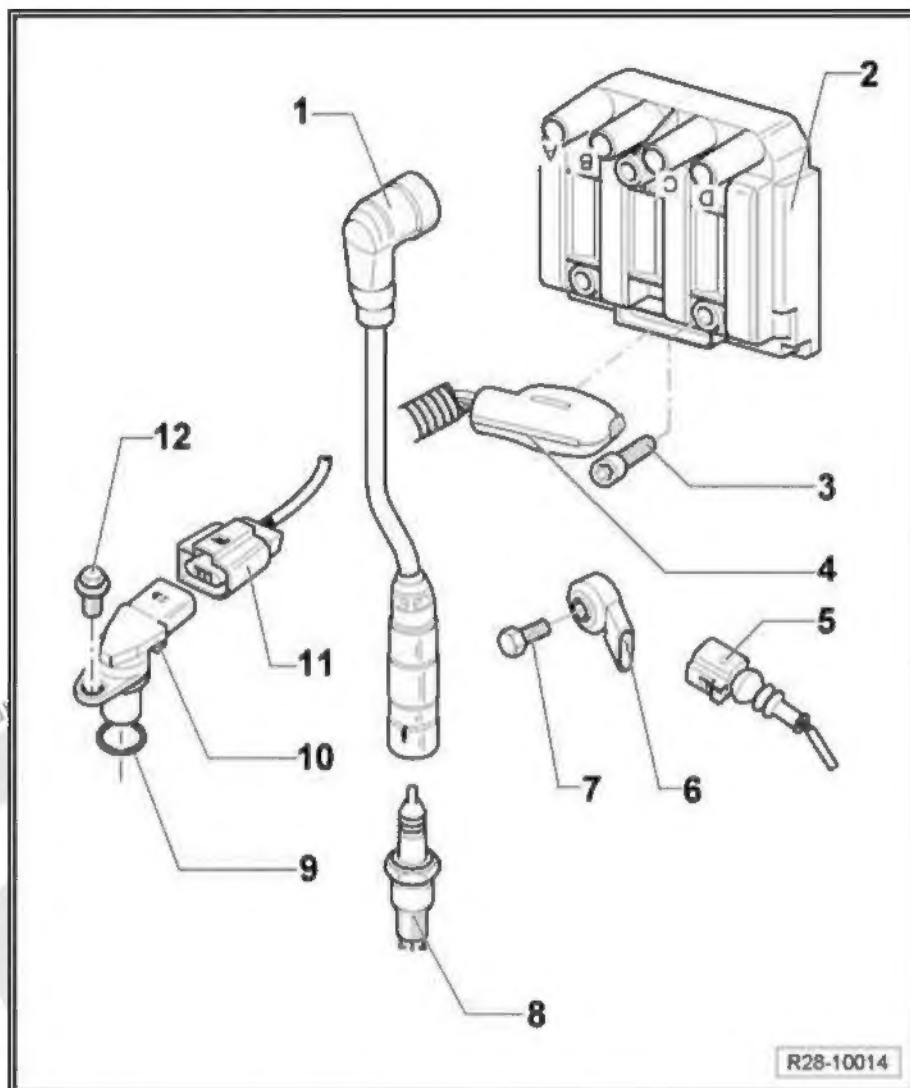
- ☐ Replace when damaged.

### 10 - Hall Sender - G40-

- ☐ Installation location ⇒ [page 162](#) .

### 11 - Connector

- ☐ Black, 3 poles.
- ☐ To Hall Sensor - G40- .
- ☐ Gold plated connector contacts.





12 - 10 Nm

### 1.2.3 CPBA Engine

#### 1 - Connector

- ☐ Black, 4 poles.
- ☐ For the ignition pump.

2 - 8 Nm

3 - Ignition coil 1 with final power stage - N70- , Ignition coil 2 with final power stage - N127- , Ignition coil 3 with final power stage - N291- , Ignition coil 4 with final power stage - N292-

- ☐ Check: ⇒ Vehicle diagnostic tester.

#### 4 - Connector

- ☐ Black, 2 poles.
- ☐ For Knock sensor 1 - G61- .
- ☐ Gold plated contacts for Knock sensor 1 - G61- and connector.

#### 5 - Knock sensor 1 - G61-

- ☐ Installation location ⇒ [page 162](#) .
- ☐ Gold plated contacts for Knock sensor 1 - G61- and connector.

6 - 20 Nm

- ☐ Tightening the torque influences the operation of the Knock Sensor 1 - G61- .

#### 7 - Connector

- ☐ Black, 3 poles.
- ☐ For Hall Sensor - G40- .
- ☐ Gold plated connector contacts.

#### 8 - Hall Sender - G40-

- ☐ Installation location ⇒ [page 162](#) .

#### 9 - Seal

- ☐ Replace when damaged.

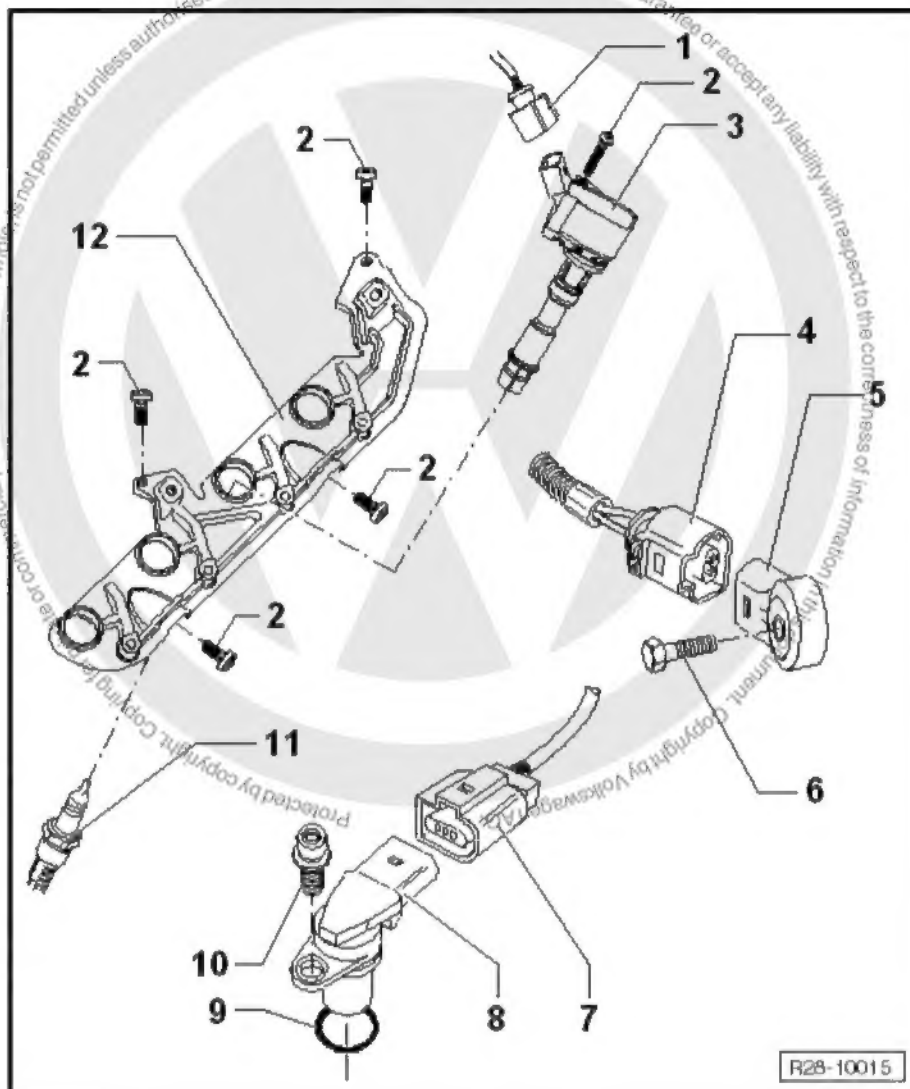
10 - 10 Nm

#### 11 - Spark plugs - Q-

- ☐ 30 Nm
- ☐ Remove and install with Spark plug wrench - 3122B- .
- ☐ Type and inter-electrode gap ⇒ [page 197](#) .

#### 12 - Support

- ☐ To fasten the Ignition coil 1 with final power stage - N70- , Ignition coil 2 with final power stage - N127- , Ignition coil 3 with final power stage - N291- and Ignition coil 4 with final power stage - N292-





### 1.3 Safety measures

Consider the following in order to avoid personal injury and/or deterioration of the injection and ignition systems:

- ◆ Do not touch or disconnect the ignition cables with the engine running or starting.
- ◆ Loosen and connect injection and ignition system cables, including the measuring equipment cables, only with ignition off.

If during a test cycle, it is necessary to use test and measuring equipment, consider the following:

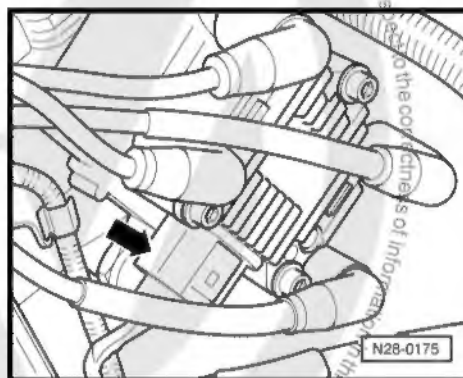
- ◆ Always install test and measuring equipment on the back seat and have them operated by a second mechanic.

If test and measuring equipment are operated from the passenger seat, the person seated there may be injured should the airbag activate in case of accident.

- ◆ If the engine is to be turned over at starting speed, without starting:
  - Disconnect the 4-pole connector from the Ignition transformer - N152- -arrow- .

CCNA engine to 07/2009

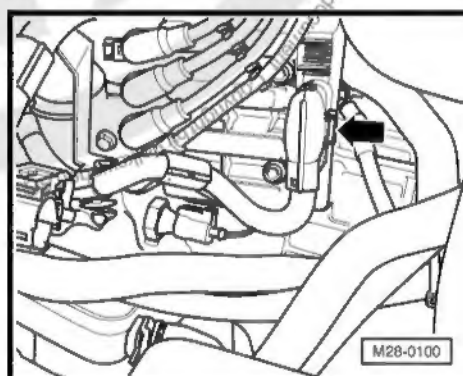
CCNA engine as of 08/2009



- Disconnect the 6-pole connector from the Ignition transformer - N152- -arrow- .

CPBA Engine

- Disconnect connectors from Ignition coil with final power stage .



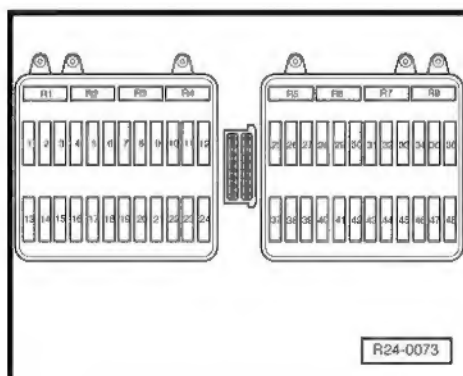
Continuation:

- Remove fuse 33 from fuse box.



Note

*When fuse 33 is removed, power supply to the injector valves is interrupted.*





## 1.4 Spark plugs - Q- - test data

Engine codes	AQZ	BJE	BNX/CCNA	CCNA (with ignition transformer 4X1 as of 08/2009)	CPBA
Firing sequence	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2
Spark plug <small>15) 13) 14)</small>					
VW	101/905 608// or 101/905.609//	101/905 623// or 101/905 632//	101/905 625// or 101/905 610/ C	101/905 610/ D	030/905/607
Manufacturer designation	NGK BKUR5ETC10 or BOSCH FL7HTCOR	NGK ZFR7R-G or BOSCH FQ5LER2	NGK BKR7ESB or BOSCH F5DER2	BOSCH F5DPP302	NGK FR7D- DEG
Inter-electrode gap	1,0 ..1,1 mm or 0,9...1,0 mm	0.8.0.00.9 mm	0.8.0.00.9 mm	0.8.0.00.9 mm	0.8.0.00.9 mm
Tightening torque	30 Nm	30 Nm	30 Nm	30 Nm	30 Nm

13) Current values and replacement intervals of the spark plugs: ⇒ Exhaust gas Test Folder.

14) Remove and install Spark plugs - Q- using Spark plug wrench - 3122B- .

15) Remove and install spark plug cables using the Assembly tool - T10029- (except CPBA engine).